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SUMMARY OF RECENT ABSTRACTS*

II. YELLOW FEVER†

Epidemiology

Yellow fever has been known in the Congo for many years, but COURTOIS *et al.* (p. 1157) remark that all efforts at isolating the virus have hitherto been unsuccessful. They now report several successful isolations in an area of the Eastern Province where there was a recrudescence of the disease, and they note that protective antibodies existed in over 80% of persons more than 30 years old. The disease is enzootic in forest monkeys and is maintained there by *Aedes africanus*, and may be spread to man if the monkeys come into contact with the peri-domestic *Aedes simpsoni*, which bites man.

BUSTAMANTE (p. 802) traces the history of yellow fever in Mexico. He thinks that it has long existed there and was not imported from Africa, and he cites documentary evidence from the 15th century and later in support of his thesis.

KERR *et al.* (p. 581) report on neutralization tests on sera taken in a district of Colombia in 1936–38, which indicated a considerable amount of infection with yellow fever. *Haemagogus* mosquitoes were present, but no wild primates, and transmission may have been at least partly from man to man [though certain marsupials exist there which may have played a part, as noted in comment by Stuart]. BRICEÑO ROSSI (p. 1048) records the first isolation of yellow fever virus from sylvan monkeys in Venezuela.

Transmission

PELLER (p. 237) recalls the work of Ffirth, who in a thesis presented in 1804 (in the United States) reported his experiments to discover how yellow fever is transmitted. This involved attempts to infect animals with vomit from yellow fever patients, and also a series of heroic experiments in which he attempted to infect himself by similar means and by exposing himself to direct contact with

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1960, v. 57. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on yellow fever in this series, see the February issues of the *Tropical Diseases Bulletin* each year since 1939.

the patients. All the experiments were negative and he concluded that the disease could not be communicated by the secretions or excretions. His work is too little known.

BOORMAN (p. 893) observed that *Aedes aegypti* commonly defaecates fluid immediately after feeding on blood-virus mixtures through a membrane, but could not find evidence of virus in this fluid unless it contained whole blood. Transmission of virus disease in this way is improbable. He (p. 1259) found Uganda S, Semliki and yellow fever viruses in the haemolymph of *Aedes aegypti* from 2 to 98 days after infected feeds. With Uganda S he found evidence that the virus may reach the haemolymph, and hence all the tissues, without prior multiplication in the gut cells.

SURTEES (p. 583) studied *Aedes aegypti* in Lagos and in a forest village in Nigeria; there was a high incidence of breeding in houses but this was reduced in Lagos where there is a piped water system. The best method of control would be by individual treatment of potential breeding sites, immediately before the rains, with larvicidal pellets of plaster of Paris and BHC. THOMAS (p. 1258) notes that in Sierra Leone *Aedes aegypti* is essentially an urban mosquito in and around Freetown, unlike the semi-wild types of Nigeria and the wild types of East African forests.

TINKER and HAYES (p. 114) point out that *Aedes aegypti* can still be found in an extensive area of the south-east United States, and refer to the danger of urban epidemics if yellow fever is ever introduced.

Aetiology: Immunization

PORTERFIELD (p. 363) has developed a plaque technique for the titration of yellow fever virus and antisera in which cells from trypsinized 10-day chick embryos are grown in monolayers for 24 hours, and then infected and overlaid with an agar medium. The plaque count is directly related to the dilution of the inoculum. Neutralization tests are carried out by mixing dilutions of inactivated antisera with virus, incubating and plating on the monolayers, overlaying with agar and counting the plaques. Details are described. It was found that sera hyperimmune to Uganda S and West Nile viruses gave some degree of neutralization of yellow fever virus, and sera after yellow fever immunization, and after recovery from the disease, gave high neutralization.

HALLAUER (p. 803) discusses the cultivation of yellow fever virus in human tissue culture—HeLa, KB and Detroit 6 cells. Considerable detail is given in the original.

COLLIER *et al.* (p. 362) examined various diluents for yellow fever virus, to find which was the best for laboratory use in experimental work, and found that the virus could be preserved at full virulence for 24 hours at 0°C. in a 10% suspension of normal mouse brain in physiological saline, but that other diluents—normal human serum, mouse ascitic fluid, chick embryo suspension, bovine albumin solution—were not so favourable.

COLLIER *et al.* (p. 583) propose a method for the graphic recording of the virulence of a virus; the original should be consulted for details.

COLLIER and DE WIT (p. 360) have been able to show that the yellow fever vaccine virus strain 17D is able to grow in the ascitic fluid cells of mice infected with the Krebs-2-carcinoma strain, and that after continued passage the virulence of the virus is reduced. This weakened virus, on inoculation into mice, produced strong immunity to the original 17D, but only slight immunity

to the neurotropic 17D and Asibi strains. Intracerebral mouse passage increased the virulence of the strains attenuated by passage in ascitic fluid. They (p. 698) show that the titre of virus in the fluid of mice with Krebs-2 ascites tumour fell quickly after inoculation with 17D and Asibi virus, and rose again, to fall again later. The experiments reported are interpreted as demonstrating the eclipse phenomenon—the complete loss of infectivity of virus after adsorption into a cell, followed by later appearance of virus—but in comment Gordon Smith does not think the evidence more than suggestive.

MEERS (p. 361) passaged 17D vaccine virus intracerebrally in mice, and found that the average survival period shortened from 14 days originally to 10 days at the 17th passage, but there was little change in the mortality rate in young mice inoculated intraperitoneally with various passage strains, though with infant mice inoculated subcutaneously there was an apparent increase in pathogenicity, and in monkeys inoculated intracerebrally the incubation period was reduced, and the encephalitis rate increased, at the 17th passage. Only the first passage virus was within WHO limit for vaccine virus. With 17D virus the loss of titre during the process of freeze drying by the centrifugal technique was found by him (p. 584) to be as much as 67%. He describes a technique which reduced this loss to only 20%.

PANTHIER and HANNOUN (p. 1048) report the virulence of 17D (unlyophilized) and Dakar vaccine for chick embryos. The 17D was more virulent than the Dakar vaccine when estimated on a quantitative basis.

PANTHIER *et al.* (p. 893) show that a preliminary intradermal inoculation of 17D vaccine would give a positive allergic reaction in about 20 minutes in persons of allergic tendency. But even if the reaction was strong enough to contraindicate the second (subcutaneous) dose, the immunity conferred by the intradermal dose was by no means inconsiderable. FEITEL *et al.* (p. 1159) report what is probably the first case of encephalitis after yellow fever immunization to be recorded in the United States; the patient was a child 10 weeks old and the vaccine was 0·2 ml. of 17D.

The *WHO Technical Report* No. 179 (p. 699) contains requirements for preparation, standardization, testing, storage and transportation of yellow fever vaccine.

Diagnosis

PANTHIER and HANNOUN (p. 1158) observe that a complement-fixation test with an antigen prepared from the brain of mice infected with yellow fever virus may be positive within 3–4 days after onset of the disease, and may be valuable in diagnosis in subsequently fatal cases in which histological examination of liver tissue is inconclusive. *Charles Wilcocks*

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

SOEIRO, A. & DE MORAIS, T. Subsídios para o estudo da endemia de malária no distrito do Niassa. [**Observations on Malaria Endemicity in the Niassa District, Mozambique**] *Anais Inst. Med. Trop.* Lisbon. 1959, Jan.–Dec., v. 16, Nos. 1/4, 169–78.

The English summary appended to the paper is as follows:—

"Following the provisional classification of W.H.O., the district of Niassa can be considered as mesoendemic as regards the epidemiology of malaria.

"The main incidence seems to occur during the heavy rains period, that is from October to March.

"The great majority of infection cases are due to *Plasmodium falciparum* (93.33%)."

SOEIRO, A. & DE MORAIS, T. Subsídios para o estudo da endemia de malária no distrito de Moçambique. [**Observations on Malaria Endemicity in the Mozambique District**] *Anais Inst. Med. Trop.* Lisbon. 1959, Jan.–Dec., v. 16, Nos. 1/4, 159–67.

The English summary appended to the paper is as follows:—

"After the provisional classification of W.H.O. the district of Mozambique is a mesoendemic zone. Having in view its mean temperature of 25.04°, relative humidity of 70.7 per cent and that 19.29 per cent of the rain falls in the dry season, the transmission of malaria must decrease or even stop during this time of the year."

DIMTCHEV, D., STÉFANOV, S., COVTCHAZOV, G. & CHRISTOVA, T. Sur la composition des espèces de la faune des anophèles et des variétés de *A. maculipennis* Meigen sur le littoral bulgare du Danube. [**Species Composition of Anopheline Fauna and Varieties of** *Anopheles maculipennis* **on the Bulgarian Shore of the Danube**] *Folia Med.* Plovdiv. 1960, v. 2, No. 1, 25–31, 5 figs. [14 refs.]

Collections of anopheline mosquitoes were made in 28 different places in Bulgaria, along the Danube, between 1956 and 1958. Of 81 larvae identified, 80 belonged to *Anopheles maculipennis*. The adults captured were also predominantly *A. maculipennis*, though smaller numbers of *A. bifurcatus* [*claviger*] and *A. pseudopictus* [*hyrcanus*] were also taken. Some of the *maculipennis* females were allowed to oviposit and about 300 of them assigned to subspecies by egg patterns. There were 32·1% *A. m. typicus*, 63·1% *A. m. messeae*, 1·8% *A. m. melanoon* and 0·3% *A. labranchiae atroparvus*. These proportions and their geographical distribution were explicable in reference to ecological conditions. Thus, *A. m. typicus* prefers shallow sheets of water,

with little plant life, in undulating dry country; *A. m. messeae* thrives in shoals of water with dense aquatic vegetation in wild uncultivated land; *A. l. atroparvus* prefers brackish swamps.

It is pointed out that improvements in agricultural practice along the Danube were tending to render the environment more suitable for *typicus* than *messeae* [this *Bulletin*, 1956, v. 53, 968]. This was one probable cause of the lowered malaria incidence in recent years and held promise for future attacks on the disease. *J. R. Busvine*

SAUGRAIN, J. & TAUFFLIEB, R. Anophélisme sans paludisme au Nord Tchad. [**Anophelism without Malaria in North Chad**] *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 150–52.

The observations here recorded were made at Largeau, North Chad, French Equatorial Africa, and in 3 other settlements, Kirdimi, Tigui and N'Gourma, situated 100, 180 and 80 km. respectively from it. Rainfall is extremely scanty throughout this region and in some years there is none at all. The population is concentrated in the palm groves, where there is abundant water which comes to the surface as springs, forming small lakes or pools in which the water is fresh or sometimes charged with soda. Besides the indigenous population there is a large number of immigrants including the European and African personnel of the garrison.

Autochthonous malaria has never been reported from Largeau and spleen examinations made by the medical officers of the military base have always proved negative, but in 1958 the presence of larvae of *Anopheles gambiae* was reported in palm grove pools in the Borkou region and at Largeau. The discovery of this dangerous malaria vector in a region always considered free from malaria in spite of an important reservoir immediately to the south in Oubangui and South Chad, was the *raison d'être* of the investigations now recorded, which were made in March 1959.

At Kirdimi, Tigui and N'Gourma the splenic index was *nil* among 264 subjects examined. At Largeau a single instance of splenomegaly was encountered among 160 schoolchildren and 150 women and children in the village. A single infant one year old, born at Largeau of parents coming from a hyperendemic zone of South Chad, was found to have in the peripheral blood scanty schizonts and segmenting forms of *Plasmodium malariae*. This single infection among 574 blood smears examined may have been an instance of congenital malaria.

118 anopheline larvae were collected from 31 breeding places in the palm groves of Largeau and its environs. All were identified as *A. rufipes*, a diagnosis later confirmed by breeding out certain specimens. Not a single adult *Anopheles* was found in any human habitation, even after spraying. By contrast, 43 adult *A. rufipes* were captured in 13 traps set up away from the houses and 13 females, 9 of which were engorged, were collected in 4 traps placed near a donkey stable. In a series of 28 dissections, all proved negative.

There thus exists at Largeau in North Chad a condition of anophelism without malaria. It is of interest to note that *A. rufipes* in this part of French Equatorial Africa is exophilic and zoophilic and appears to play no part in the transmission of human malaria. *G. Covell*

CORRIGENDUM

The comment in square brackets which follows the abstract of the paper by GRANT *et al.*, this *Bulletin*, 1961, v. 58, 8, should read:

"[Those interested in this important question are referred to a letter by HARRISON in the *Lancet*, 1960, Sept. 3, 547, for what happened in 1917. See also this *Bulletin*, 1960, v. 57, 671, 781.]"

RAPER, A. B. **Sickling and Malaria.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Sept., v. 54, No. 5, 503–4.

ALLISON's hypothesis that the degree of malarial endemicity determined the incidence of sickling [this *Bulletin*, 1954, v. 51, 526] has been well confirmed by his surveys of populations in East Africa [*ibid.*, 1143]. However, within this framework there are considerable differences in sickling rates between peoples of similar origin and living in areas of similar malarial pressure.

The present author offers an explanation of the interaction between malaria and the sickling gene which accounts for most of these discrepancies. Universal post-natal protection against malaria ends at about the age of 6 months. Selective protection, which differentiates between sicklers and non-sicklers, will then last only until acquired immunity protects them both. The more intense the exposure to malarial infection the earlier is immunity acquired and the shorter is the period in which mortality differs for sickling and non-sickling children. Thus less exposure to malaria will delay the acquisition of immunity and this allows a longer period for selective action. At the other end of the scale very low endemicity will lower the selective effect because the total malaria death rate is reduced. For this reason a very heavy, holoendemic malarial region may show a lower sickle-cell trait incidence in the adults, than one in which malarial transmission is less intense, and the incidence of sickling may resemble that found in a third area, where the malarial death rate is lower than in both the areas under consideration. *H. Lehmann*

BAMI, H. L., DHATT, M. S., AHLUWALIA, G. S. & RAY, A. P. **Studies on Metabolic Degradation of Pamaquin (Plasmoquin) in Monkeys.** *Indian J. Malariology.* 1960, Mar., v. 14, No. 1, 1–13, 1 chart & 5 graphs. [38 refs.]

Studies on the action of pamaquin in malaria infections have suggested [this *Bulletin*, 1948, v. 45, 962; 1950, v. 47, 965; 1951, v. 48, 14] that one or more metabolites are formed in the host tissues and good evidence was provided that it was an 8-aminoquinoline-5:6 diquinone [*ibid.*, 1951, v. 48, 862]. The present author has carried out similar studies to find out the mechanism of pamaquin degradation *in vivo*. For this purpose the drug was administered orally and intravenously to monkeys and collected urine was extracted with various solvents and the extracts chromatographed. It was also shown that the drug disappeared very quickly from the blood. Mild oxidizing agents such as hydrogen peroxide were also used directly on the drug under acid conditions.

Nicotinic acid was a possible product of oxidation and this substance was estimated in urine and blood for periods after drug administration and appeared to be present in amounts greater than normal. A scheme for conversion of pamaquin to various products as a result of oxidation *in vivo* is outlined.

J. D. Fulton

ALVING, A. S., JOHNSON, C. F., TARLOV, A. R., BREWER, G. J., KELLERMEYER, R. W. & CARSON, P. E. **Mitigation of the Haemolytic Effect of Primaquine and Enhancement of its Action against Exoerythrocytic Forms of the Chesson Strain of *Plasmodium vivax* by Intermittent Regimens of Drug Administration.** *Bull. World Health Organization.* Geneva. 1960, v. 22, No. 6, 621–31, 3 figs. [52 refs.]

This paper reports results of studies on primaquine sensitivity and on a method of administration of this drug which lessens the chance of a haemolytic crisis without detracting from its effectiveness in radical cure of *Plasmodium vivax* malaria. Occasional haemolytic reactions occurred among Negroes in the United States troops returning from Korea, who were given primaquine in an attempt to prevent the re-introduction of malaria into the U.S.A. [this *Bulletin*, 1955, v. 52, 509]. At the University of Chicago—Army Medical Research Unit—studies of primaquine sensitivity have been made with a *P. vivax* strain from the New Guinea area which requires double the standard dose of primaquine for its radical cure. It has been shown that persons showing sensitivity to primaquine and to many other drugs and some vegetable foods, have an intrinsic defect of their erythrocytes. First it was recognized that there was a diminished content of reduced glutathione, and subsequently that there was an enzyme defect of glucose-6-phosphate dehydrogenase. Population studies have revealed that this inborn error of metabolism appears to be inherited by a sex-linked gene of intermediate dominance and variable expression. This is a widespread defect found especially in an area on each side of the equator around the world roughly corresponding to the distribution of *P. falciparum* infection.

Erythrocytes having this enzyme defect have a shorter life span than do those of non-sensitive people and the older cells are more susceptible to haemolysis. Thus after an episode of haemolysis, there being a young cell population, there is a temporary partial resistance to further haemolysis. Furthermore, blood loss anaemia, for example that due to intestinal helminths, by causing more young cells to be in the circulation reduces the tendency to haemolysis in those who are sensitive to primaquine. Studies have been made of the therapeutic response in *P. vivax* malaria (Chesson strain) with the use of chloroquine together with intermittent dosage of primaquine, instead of the standard daily dosage. With 60 mgm. of primaquine weekly for 8 weeks there were 6% therapeutic failures, with 45 mgm. in the same dosage scheme there were 10% failures, and with 30 mgm. there were 55% failures. With the standard course of 15 mgm. primaquine base daily for 14 days the failure rate was almost 30% with this strain of malarial parasite.

The conclusion is that for well-disciplined population groups or military personnel a weekly dosage of 60 mgm. of primaquine for 8 weeks (combined

with the standard course of a 4-aminoquinoline drug) will cause radical cure of most *P. vivax* infections. Where strict surveillance cannot be maintained it is safer to give 45 mgm. of primaquine weekly for 8 weeks.

The paper ends with a short note comparing the toxicity and therapeutic value of Quinocide, an isomer of primaquine synthesized by ELDERFIELD [*J. Amer. Chem. Soc.*, 1955, v. 77, 4819; this *Bulletin*, 1956, v. 53, (15)] and his associates in 1949, with primaquine. Primaquine caused less severe haemolysis than did a comparable dose of Quinocide. The new drug caused gastro-intestinal symptoms. Two patients infected with the Chesson strain of *P. vivax* malaria both relapsed after a course of 45 mgm. of Quinocide base given weekly for 8 weeks. *S. Bell*

GÓMEZ MENDOZA, I. Informe del viaje efectuado para observar el programa de utilizacion de drogas antipalúdicas en la campaña de erradicación del paludismo en la República de Venezuela. **[Observations on the Programme for the Employment of Antimalarial Drugs in the Malaria Eradication Campaign in Venezuela]** *CNEP Bol.* Mexico. 1960, Apr.–June, v. 4, No. 2, 74–81, 1 plan.

The author is Director of Epidemiology of the Mexican National Commission for the Eradication of Malaria. In May 1960 he visited Venezuela to study the programme for employing antimalarial drugs and the general organization of the campaign in a zone which is now in the conservation stage. He notes that of the initial malarial area in Venezuela, which amounted to some 600,000 sq. km. with a population of 4·6 million people, two-thirds (population 3·5 million) is in the conservation stage, about 30,000 sq. km. (population 684,808) is in the consolidation stage and 162,023 sq. km. (population 386,539) is still in the attack stage. Antimalarial drugs are used both for routine purposes and in the face of special problems.

When a blood film is taken from a person with fever, a single dose of chloroquine, followed by appropriate doses of pyrimethamine, is given as a routine for suppressive treatment. In the radical treatment of *Plasmodium falciparum* infections, chloroquine is used and is followed by suppressive chloroquine or pyrimethamine weekly for 4 weeks to prevent relapses. 108 patients were treated thus in 1959. For *P. vivax* and *P. malariae* infections, the initial chloroquine treatment is combined with primaquine, which is then given daily alone from the 4th until the 14th day. Since 1955 2,152 persons have been treated with primaquine; it is not given to infants less than 4 months old. The usual precautions are taken to look out for the well known side effects and treatment is interrupted if they appear. Where possible the drug is given under medical supervision, but in the field specially trained non-medical staff are instructed to take the necessary precautions (including haemoglobin estimation). If side effects appear, the drug is stopped and the supervisor gets in touch with the local medical officer for further instructions.

The schedules and doses of all the drugs in these treatments are tabulated in detail for 5 age-groups.

Special problems arise in a focus in the west, where malaria transmission persists, probably because of travel across the border for the importation of seeds, and in a focus in the east, where transmission persists for various reasons.

The respective vectors are *Anopheles nuñez tovari* and *A. aquasalis*, both extra-domiciliary in habit. In both areas mass suppression with pyrimethamine is used (or where resistance to it occurs, chloroquine is given). The schedule is described: 183,930 persons were so treated in 1959.

The organization is described fully. There were 39 inspectors and two grades of "rural visitors" comprising respectively 138 and 35 persons. Their duties included distribution of drugs, taking blood films, collecting mosquitoes, and seeing whether all the local houses have been sprayed.

There is a description of mass treatment with primaquine in a small locality in Sucre State where 12 *P. vivax* infections were found in August–September 1959. The intention was to treat all the 204 inhabitants, but in fact 159 (78%) had full treatment, 16 had incomplete treatment and 29 were untreated for various reasons. In December 1959, 149 blood films were examined and all were now negative. The usual precautions were taken and it was necessary to suspend treatment in 4 cases.

Finally the author describes the organization in one consolidation zone formed by the Federal District and Miranda State, which includes the capital, Caracas. *A. darlingi* has disappeared since spraying began but *A. albimanus* persists in some coastal areas. The last autochthonous cases appeared in this zone in April 1950. Between 1955 and 1958, nearly 35,000 blood films have been taken and all were negative.

The author concludes by considering how the information might be used with benefit in the malaria campaign in Mexico; but because of the great amount of efficiency required, the heavy cost and the long-term implications, he feels that careful thought must be given to the matter before some of these mass methods are embarked upon there for eliminating foci of malaria.

H. J. O'D. Burke-Gaffney

FERUGLIO, F. S. & PINO, G. Considerazioni su sei casi di malaria osservati in Sardegna dopo alcuni anni dalla disinfestazione con DDT. [**Comments on Six Cases of Malaria observed in Sardinia after Some Years of Disinfestation with DDT**] *Parassitologia*. Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 161–3. English summary (5 lines).

SZ. GULYÁS, Magda & ZOLTAI, N. Szúnyogtenyészés és az ellene való védelezés rizsföldeken. [**The Mosquito Fauna of Ricefields and Measures for Controlling it**] *Egészségtudomány*. Budapest. 1959, v. 3, No. 4, 333–8, 2 figs. German summary (7 lines).

During and since the war economic circumstances in Hungary have made it necessary to grow rice on an increased scale, and this has given rise to an increase in the number of cases of malaria. Thus, between 1937 and 1941 the annual number of cases in the province of Békés ranged from 7 to 18, but with the introduction of rice growing in 1942 the number of cases rose to 44; and 40, 16 and 31 cases were recorded in 1944, 1947 and 1948. The mosquito fauna of the affected areas was studied, and in an investigation of the effect of various larvicides applied to the water in the ricefields satisfactory results were obtained with DDT dust applied weekly at the rate of 0·2 gm. per sq. m. In untreated

water the number of larvae present ranged from 6 to 25 per litre, and three-quarters belonged to the genus *Anopheles*. With a view to reducing the cost of the treatment the use of lower concentrations of DDT was investigated, and an effect lasting for 3 months was obtained when DDT was applied to the water surface at the rate of 0·05 gm. per sq. m. No effect was observed when the powder was applied to the soil before the fields were flooded, but satisfactory destruction of larvae was obtained when DDT emulsion was added to the irrigation water in a concentration of 1 p.p.m. *D. J. Bauer*

EAST AFRICA HIGH COMMISSION. **Report on the Pare-Taveta Malaria Scheme 1954–1959** [EAST AFRICAN INST. MALARIA & VECTOR-BORNE DIS., in collaboration with COLONIAL PESTICIDES RES. UNIT]. pp. iii + 90, 12 text figs. & 5 figs. on 3 pls. 1960. Dar est Salaam: Govt. Printer. Shs. 8/50.]

The object of this scheme was to provide the answer to two questions: (1) can malaria transmission be arrested by the adoption of a technique of spraying with residual insecticides which might be economically feasible in East Africa, and (2) if transmission be interrupted or nearly so, what would be the effect on human health? Attention was concentrated on the assessment of the results of residual spraying on the numbers and bionomics of the anopheline vectors of malaria, on the methods and costs of spraying and on the selection of methods of physical assessments which would enable changes in health to be measured, or at least detected.

An area was sought out in which there was malaria transmission of high intensity, which was accessible and had good communications, was as isolated as possible from other malarious areas by natural features, and was of a size that could be treated within the limits of possible financial resources. The stretch of country chosen comprised the Pare District of Tanganyika and the Taveta sub-District of Kenya. It is about 100 miles long by 20 to 25 miles in width and has a population of about 53,000, occupying some 17,500 dwellings. In the mountains above there dwell about 79,000 people, who are also at risk of malaria when they descend to the plains for various purposes.

After an initial survey the first round of residual spraying was begun in July 1955, and 5 further spraying cycles were carried out at approximately 8-month intervals, there being an interval of at least 2 months between spraying rounds. The insecticide used was dieldrin, the nozzle dosage aimed at being 1·0 gm. per sq. metre on the first round. This was reduced to 0·5 gm. per sq. metre in subsequent rounds. The average cost of the operation worked out at 3·95 shillings per house, or 1·15 shillings per head of population for each spray round.

As a result of 4 years of spraying, transmission was lowered to a level at which malaria ceased to be of significance in the area treated. The well-recognized influence of malaria on infant mortality and on fertility was again demonstrated, but the coincident morbidity in early life is clearly only one of the factors which depress infant and child health and it did not measurably limit growth. On the other hand malaria was shown to have an ill-effect on haemoglobin levels. This influence appears to be greatest in infancy but continues to be present and rises again at the end of the life span.

Although the technique adopted produced so great a reduction of malaria transmission that it became possible to attempt an evaluation of its importance,

there was still left a residuum of parasitaemia among the population. There also remained a considerable reservoir of anopheline vectors in the treated area. Although *Anopheles funestus* was eradicated, *A. gambiae* was not; it survived in considerable numbers, in spite of the proved insecticidal efficacy of the method used. It is suggested that the survival of the *A. gambiae* population was due to its catholicity of habit, both in feeding on man or animals and in resting within or outside the houses. It is concluded that this species is primarily zoophilic and though so ready to attach itself to man is equally ready to revert to other hosts as a source of food. This conclusion seems to be of profound significance to the planning of a comprehensive health programme, and to an appreciation of the relationship between health and the social and agricultural development on which the future of African progress depends. If such development leads to the separation of man and the mosquito vector and to the reduction of opportunities for the breeding of the vector in man's environment, residual spraying is likely to provide a means for completing the reduction of man-vector contact in tropical Africa to a point where malaria transmission will be arrested.

During the operation of this scheme a considerable volume of research has been carried out on the bionomics of the local mosquito fauna and on the assessment of malaria in man by age-groups. The results of these investigations are set out in the various tables and graphs included in the Report, and they have also been the subject of some 20 articles published in scientific journals. A list of these is given in an appendix to the Report. *G. Covell*

DRAPER, C. C. & SMITH, A. **Malaria in the Pare Area of Tanganyika. Part II. Effects of Three Years' Spraying of Huts with Dieldrin.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, July, v. 54, No. 4, 342–57, 4 figs. [14 refs.]

In a previous paper [this *Bulletin*, 1957, v. 54, 917] the authors described this area and the epidemiology of its malaria. They now record observations on mosquitoes and malaria during the 3 following years, during which the houses were sprayed with dieldrin at 8-month intervals.

All huts where transmission was thought to occur were first sprayed during the latter half of 1955, with an approximate wall dosage of 80 mgm. of dieldrin per square foot; half this dosage was used in subsequent sprayings, the 6th and last round being completed in February 1959.

As a result of this treatment the type form of *Anopheles funestus* completely disappeared and there was a great reduction in the numbers of *A. gambiae* found alive in huts. The population of *A. gambiae* was also reduced, except in places where there were opportunities for extensive feeding on cattle. No changes were noted in the host choices of *A. gambiae*. The only infected mosquitoes encountered were from places inadequately sprayed.

Dieldrin had some irritative effect on mosquitoes and its lethal action was slow, but in the dosage used it caused a high mortality among *A. gambiae* coming into contact with sprayed surfaces, an effect which was very persistent. In contrast to its effect on other arthropods, no change in susceptibility of *A. gambiae* to dieldrin was noted in the area sprayed.

There was a marked fall in all human malaria indices, but evidence from several sources suggested that a low degree of transmission persisted throughout

the period of observation. It is concluded that though continuation of spraying might bring about a further reduction in malaria, it is doubtful whether under local conditions this could ever proceed to complete arrest of transmission. Some modification of technique, such as a shortening of the spray cycle or the inclusion of the eaves of huts in the spraying programme, might contribute to greater success.

The results are set out in great detail in tables and figures. *G. Covell*

SHAMA SASTRY, H. **Results obtained in the Second Year of Pilot Study of Malaria Surveillance in Mysore State.** *Indian J. Malariology.* 1960, Mar., v. 14, No. 1, 55–75.

A 6-year malaria eradication programme established in Mysore State, was begun in 1958, and the preliminary results of a pilot study to determine and test the working procedures of surveillance during the last year of the attack phase and subsequent 3 years of the maintenance phase, were described in an earlier paper [this *Bulletin*, 1960, v. 57, 557]. The report now presented refers to results obtained during the second year of study.

The whole region under survey comprises two zones, in one of which the mosquito vector is *Anopheles fluviatilis*, in the other *A. culicifacies*. In certain sections spraying has now been discontinued; in others it is restricted to one round annually. There have been some changes in the pattern of surveillance in certain areas to meet changing conditions, *e.g.* in the rice tracts of North Kanara District, where the frequency of house visits has been lengthened from once a fortnight to once monthly. In some sections surveillance is still maintained exclusively by staff of the malaria organizations; in others general public health work and malaria surveillance are now integrated. Certain lacunae in the organization have been detected and steps taken to overcome deficiencies.

During the year 25,855 cases of fever were encountered, of which 21 were found microscopically positive. In addition 6 cases positive for parasites were detected in the study area during other surveys. 8 of the total cases were classed as imported, 4 as sporadic and in one case full investigation could not be done. The remaining 14 cases were in a particular section of the population living in the forest areas of the south-eastern portion of Coorg, whose habits are nomadic.

In spite of increased vigilance under the surveillance programme the number of positive malaria cases has continued to dwindle, except in the section of Coorg referred to above. It is notable that in North Kanara, where spraying has been discontinued since 1956, there has hitherto been no evidence of any increase in malaria incidence.

The findings are discussed and set out in detail in 17 tables. *G. Covell*

DAS, M. & MAMMEN, M. L. **Report on the Enquiry on DDT Resistance in *A. culicifacies* in Bombay State.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1959, Nov., v. 7, No. 6, 157–68, 1 folding map.

Anopheles culicifacies, over much of its range in India, is susceptible to DDT. After reports of higher tolerance to DDT by this species in certain areas of

Bombay State [this *Bulletin*, 1960, v. 57, 882], the authors undertook a survey of DDT resistance in this species in Bombay State.

The survey lasted from October to December 1959, and collections were made from 169 villages in 10 districts. Susceptibility tests were carried out by the WHO technique. The results showed that, in general, the frequency of resistant mosquitoes in the populations tested was low. Cases of " behaviouristic " resistance were observed in some localities; thus, in one village, the species was found to rest in large numbers in an unsprayed, well-lighted and well-ventilated cattle shed, a habitat considered unsuitable as a resting place for *A. culicifacies*. Instances where the mosquitoes rested in places not normally sprayed or not reached by sprays, such as the palm-thatched roof of a well-sprayed house, were also observed.

In evaluating results, the authors caution that the seasonal variation in DDT susceptibility exhibited by *A. culicifacies* in some areas will have to be considered. *M. G. R. Varma*

PETERS, W.; STANDFAST, H. A. **Studies on the Epidemiology of Malaria in New Guinea. Part I. Holoendemic Malaria—the Clinical Picture** [PETERS]. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, May, v. 54, No. 3, 242–9, 1 fig. **Part II. Holoendemic Malaria—the Entomological Picture** [PETERS & STANDFAST]. *Ibid.*, 249–54. **Part III. Holoendemic Malaria—Analysis of Data and relation to Control** [PETERS]. *Ibid.*, 254–60. [32 refs.]

The observations on which these papers are based were made in the Maprik area of New Guinea which lies immediately south of a line drawn between Aitape and Wewak. The project area covers 400 square miles, with a population of 32,000. The region is characterized by ridged foothills sloping southwards from the Prince Alexander Range to the Sepik Plains. Maprik itself is about 800 feet above sea level and receives an average of 80 inches of rainfall a year.

A preliminary survey showed a spleen rate in adult males of 26% and in infants and children up to almost 100%. Parasite rates were 33·9% in adults and up to almost 100% in infants and toddlers. The infant parasite rate was used to construct a curve which gave a value of 0·015 for the inoculation rate. The picture presented is one of true holoendemicity.

The dominant vector species of mosquito is *Anopheles punctulatus* with a natural daily survival rate of 87%. It is highly endophilic and endophagous and has an average sporozoite rate of 3·3%.

The area was divided into 3 sectors, one of which was sprayed with dieldrin in October-November 1957, in April 1958 and in October-November 1958. Another sector was sprayed with DDT during the 3 months following each spray-round of the dieldrin sector. The third sector was left unsprayed for comparison purposes.

The results so far achieved lead the authors to believe that under the exceptional conditions prevailing at Maprik it is unlikely that DDT or dieldrin alone sprayed at 6-month intervals will succeed in arresting transmission entirely, but that an increase in the frequency of spraying to once every 4 months would succeed. An increase in the daily mortality of anophelines in the region of

40% is required to secure control of malaria. This can only be achieved if the residual insecticide effects a daily mortality of at least 80%. It was not possible to determine whether DDT or dieldrin will be a more effective insecticide for general use in a large-scale control programme in New Guinea.

The authors agree with the suggestion put forward by METSELAAR [this *Bulletin*, 1957, v. 54, 651 and 778] that the fundamental difference between malaria in New Guinea and tropical Africa is the fact that the sickle-cell gene is absent from New Guinea indigenes. Malaria ranges in intensity in New Guinea from anophelism without malaria through highly unstable hypoendemic and mesoendemic situations to an extreme degree of holoendemicity. Given optimum conditions, the *Anopheles punctulatus* group of mosquitoes are vectors as dangerous as are *A. gambiae* and *A. funestus* in tropical Africa. *G. Covell*

LABRECQUE, G. C., GAHAN, J. B. & WILSON, H. G. **Residual Effectiveness of some New Insecticides against Adults of** *Anopheles quadrimaculatus* **Say.** *Mosquito News.* 1960, Sept., v. 20, No. 3, 238–41.

"In laboratory tests with 19 insecticides as residues on plywood panels at 100 mg. per square foot, Hercules AC-5727 was the most effective, giving 97 percent to 100 percent 24-hour mortality after a 15-minute exposure on panels aged for 24 weeks. Malathion usually gave 100 percent kills after 30-minute exposures, and DDT after 60-minute exposures. Bayer 29493 was superior to malathion and DDT for 16 weeks, and Monsanto CP 11223, American Cyanamid 12008, and Bayer 24869 were superior during the first week. Sevin gave 100 percent kills, and Methyl Trithion and dimethoate 96 percent to 100 percent after 60- or 120-minute exposures. The other compounds were less effective."

BLAKESLEE, T. E., KELLER, J. C., BULLOCK, H. R., BARNES, W. W. & BLACKBURN, V. L. **DDT Resistance in** *Anopheles quadrimaculatus* **from the U.S. Army Chemical Center, Maryland.** *Mosquito News.* 1960, Sept., v. 20, No. 3, 311–13.

VARGAS, L. & ALMARAZ UGALDE, A. Evaluación epidemiológica de la erradicación del paludismo en 1959, tercer año de cobertura integral. [**Epidemiological Evaluation of Malaria Eradication in Mexico in 1959**] *Salud Pública México.* 1960, Apr.–June, v. 2, No. 2, 257–304, 11 graphs.

The authors extend their previous observations [this *Bulletin*, 1960, v. 57, 883] to an analysis of the situation in the third year of "complete coverage". They give an interesting discussion of various aspects of the campaign, referring to points relating to epidemiology, the parasites and mosquitoes and insecticide resistance. There is a useful tabulation of the different forms of susceptibility and resistance and their implications. The incidence of positive blood-slides and of malarial morbidity in the various zones are discussed, together with details regarding organization, spraying, insecticides and distribution of antimalarial drugs.

All these observations are supported by 25 tables and 11 figures, which set out detailed findings for 1959 and, in many cases, for the three years 1957, 1958 and 1959.

The following points are of special interest. In 1959, 820,869 blood films were examined, of which 3,202 (0·39%) were positive; 39% of the proved cases came from places in zones VIII and X. Malaria morbidity in 1959 was 21·1 per 100,000. 84·3% of cases were due to *Plasmodium vivax*, 13·4% to *P. falciparum*, 1·7% to *P. malariae* and 0·6% were mixed or unidentified infections. During the year, 449,528 people received antimalarial drugs, 14·5 million persons were protected by the spraying of their houses, 3·3 million houses were sprayed and 1·8 million kgm. of insecticide were used, almost entirely DDT. Most of the figures are given for each of the 14 zones and a number of the tables are set out in terms of age-groups.

This paper gives a very informative and full account of the campaign during the 3 years reviewed. *H. J. O'D. Burke-Gaffney*

MANCERA VIGUERAS, Ofelia & HERNÁNDEZ CORZO, J. El efecto irritante en mosquitos de algunos insecticidas de contacto. Pruebas con *Anopheles* (N.) *albimanus*, Wied. [**Irritant Effect of Some Contact Insecticides on Mosquitos. Test with** *Anopheles albimanus*] *CNEP Bol.* Mexico. 1960, Apr.–June, v. 4, No. 2, 82–5.

The English summary appended to the paper is as follows:—

"The irritation of mosquitos provoked by various contact insecticides is studied. Lots of 20 mosquitos are introduced into large plastic cylinders whose ends are covered with papers treated with acetone solutions of insecticides. The flights of the irritated mosquitos are counted over a period of twenty minutes.

"DDT and diazinon are the most irritative substances, malathion is moderately irritant, BHC and lindane even less, baytex produces almost no irritation, and chlordane and dieldrin are distinctly not irritant."

[See this *Bulletin*, 1960, v. 57, 788.]

TRINIDAD GOVT. **Annual Report of the Malaria Division, Health Department, Trinidad & Tobago, 1959.** 76 mimeographed pp., 2 figs. & 5 diagrams. [1960.] Port of Spain, West Indies.

Only 97 cases of proven malaria were discovered in Trinidad during 1959, and there were no deaths ascribed to malaria. This compares with 376 cases in 1958. In Tobago, 26,012 blood-slides were examined by special survey teams, and all were negative. The malaria eradication programme was commenced formally on 1st January 1959. It consists of DDT spraying every 6 months in *Anopheles aquasalis* areas; in *A. bellator* areas bromeliad spraying and clearing continue, with mass chemoprophylaxis (chloroquine and primaquine monthly) and therapy (distribution of chloroquine and pyrimethamine, radical treatment of proven cases) as adjuvants. The work of evaluation teams was intensified.

A. aquasalis is still breeding freely in some areas. Entomological work included a number of tests of resistance to insecticides. In an area where

dieldrin has been used as a larvicide for 4 years, *A. neomaculipalpus* adults were partly resistant to 4% dieldrin for 1 hour. A proportion of the *A. aquasalis* population is highly resistant to dieldrin, withstanding 8 hours' exposure to 4% concentration. *Aedes aegypti* has shown resistance to DDT but not to dieldrin. In areas where *A. aegypti* has not yet been eradicated, spraying with dieldrin instead of DDT (see above) has been continued. Few breeding foci of *A. aegypti* now remain. Dieldrin has far more effect on bedbugs, but cockroaches have become resistant to it, and its use on outside walls kills many of the wasps that normally keep down caterpillar and bag worm pests. There has been no instance of dieldrin poisoning among workers, but precautions such as the use of protective clothing and bathing after work have been enforced.

[This abstract should be read as a continuation of those on the 1957 and 1958 reports, see this *Bulletin*, 1959, v. 56, 417; and 1960, v. 57, 5.]

B. B. Waddy

ALLEN, D., EDINGTON, G. M. & SCHNIEDEN, H. **Iron in Experimental Malaria: Relation to the Histological Picture.** *Ann. Trop. Med. & Parasit.* 1960, Oct., v. 54, No. 3, 272–4.

Haemosiderin, an iron pigment formed as a result of blood destruction, is present in tissues of the malarial host along with haematin, the pigment formed from haemoglobin of the red cell by the parasite, and first named haemazoin by SAMBON. The former can be stained by Perl's reagent to show the presence of iron, which is not the case with malarial pigment. The authors have investigated whether any correlation exists between the iron content and concentration in liver and spleen and the histological picture.

The rat was used as host animal and infected with *Plasmodium berghei*. The results obtained are set out in tables and show that the splenic iron content of rats increased while the concentration decreased during a 10-day infection with *P. berghei*. There was no significant increase in iron content of liver during that period, in spite of the presence of pigment. Haemozoin increased during that period and iron-containing material stained by Perl's stain decreased.

J. D. Fulton

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal*; American—*Chagas's disease and other trypanosome infections. In each form the following order is followed:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

LE BERRE, R. & ITARD, J. Validité des sous-espèces *Glossina fusca fusca* Walker, 1879 et *Glossina fusca congolensis* Newstead et Evans, 1921. Diptera, Muscidae. [**Validity of the Sub-Species** *Glossina fusca* and *G. f. congolensis*] *Bull. Soc. Path. Exot.* 1960, May–June, v. 53, No. 3, 542–50, 2 figs. [10 refs.]

SAUNDERS, D. S. **Some Records of Dipterous and Hymenopterous Parasites of Tsetse Fly Pupae.** *Proc. Roy. Entom. Soc. of London.* Ser. A. 1960, Oct. 4, v. 35, Pts. 7/9, 121–3.

MORRIS, K. R. S. **New Frontiers to Health in Africa. The Creation of New, Independent States in Africa poses New Problems in the Eradication of Disease.** *Science.* 1960, Sept. 9, v. 132, 652–8, 9 figs. [11 refs.]

The example of trypanosomiasis is taken to illustrate the danger of a breakdown in the control of communicable disease, resulting from the balkanization of West Africa by the end of colonial rule. *Trypanosoma gambiense* sleeping sickness has existed in West Africa for 600 years or more but, spread as it is through human carriers, it became epidemic only after the hinterland was opened up by European occupation. In the fertile areas of the savannah, population increased by 10 to 15% in a decade, but at the same time whole river valleys were depopulated by sleeping sickness. The peak incidence of discovered cases in French West Africa was 29,798 new cases in 1941, and the British colonies were affected on a similar scale. Control was established partly by tsetse control, partly by mass survey and treatment. By these means incidence was lowered by 90 to 99%, and the death rate virtually to nil. Moreover, as the epidemic areas were cleared up, secondary foci along the trade routes leading from them improved spontaneously. The necessity for diagnosing all cases and at least rendering them uninfectious gave rise to a system of mobile field survey teams, the functions of which, when the epidemic was controlled, could be expanded to cover other mass endemic and epidemic diseases to the immense benefit of the savannah peoples.

Obstinate endemic foci of sleeping sickness persist in north-west Dahomey, around Bamako on the Niger, in Senegal, Guinea, the Ivory Coast, in Ashanti and elsewhere. These often are in forest areas in which tsetse control is practicable only by constant effort, globally planned and under skilled supervision. The disease has been kept down only by constant epidemiological vigilance in these areas, and surveillance of migrant labour, and the slightest interruption results in recrudescence. The position is unstable in that the vector remains.

"Meanwhile, the generations of a trypanosome are measured in hours, not years; epidemic diseases are no more respecters of time than of international frontiers. If the return of possibly disastrous epidemics is to be avoided, the solution must lie in the action of a body, such as the World Health Organization, with the vision and status to put forward a realistic programme of eradication on international lines." [The programme must not only be put forward: it must be carried out, and kept up indefinitely, for actual eradication is an unlikely event.] *B. B. Waddy*

BUECHNER, H. K., HARTHOORN, A. M. & LOCK, J. A. **Control of African Wild Animals.** [Correspondence.] *Nature.* 1960, Jan. 2, v. 185, 47–8.

The authors write respectively from the Department of Zoology, State College of Washington, U.S.A., the Faculty of Veterinary Science, Makerere College, Uganda, and the Faculty of Medicine, Makerere College.

They note the great increase in the destruction of wild animals where these conflicted with human interests and point out that the possible elimination of wild ungulates from Africa is a cause for concern because, for example, they can be a valuable source of meat, the disruption of the natural balance will have effects on soil or flora as yet to be assessed, there is a danger of extinction of species, and these animals have a value as a tourist attraction.

The authors are studying effective techniques for transporting animals to areas where their conflict with man is less acute and where they have a greater chance of survival. Prolonged attempts to catch them in appreciable numbers by various means have not been successful: but success has been achieved in the United States and in Africa with the use of drugs to catch animals for study purposes, and the authors have used this method in pilot experiments for moving animals to other areas.

An immobilizing drug is delivered to the animals by various means and when they are captured, a tranquillizing drug is given before the effects of the first drug have ceased: the animals may then be transported. The authors have used mostly succinyl choline chloride as the immobilizing agent and a table shows for 6 species the doses which were effective on intramuscular injection. These varied from 0·13 to 0·35 mgm./kgm. body weight according to the species and sex.

In small-scale trials, kob (antelope) and black rhinoceros have been moved from areas in Kenya, and an experiment is planned to move some of the few remaining Rothschild giraffes (only about 200 now exist) from a farming area where they reside to marginal grazing land.

Before this technique can be applied on a large scale much more work is required. The margin between effective and lethal doses is small and a wide range of drugs is being studied for their suitability. With improved methods new opportunities for study and management of wild life will develop. Under systems of cropping, killing of animals must continue, but it is hoped that the suggested methods of immobilization and transport will make a useful contribution to the preservation and proper use of wild life in Africa.

The authors have published this early report because of the interest which the work is creating. *H. J. O'D. Burke-Gaffney*

BENEDETTO, A., CORSO, P., FRUGONI, G., MAZZETTI, M. & MELE, G. Studio della tripanosomiasi sperimentale della cavia da *T. brucei*: comportamento di alcune attività enzimatiche ed ossidoriduttive nel siero e nei tessuti; comportamento nel siero del calcio, fosforo, sodio e potassio; contenuto in acqua, protidi e lipidi del fegato. [**Experimental** *Trypanosoma brucei* **Infection in Guineapigs; Enzyme and Oxidation-Reduction Activity of Serum and Tissues; Calcium, Phosphorus, Sodium and Potassium Content of Serum; Water, Protein and Fat Content of the Liver**] *Parassitologia*. Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 27–34. English summary (5 lines).

MULVEY, P. F., Jr. **The Uptake and Fate of Radioactive Elements in** *Trypanosoma equiperdum*. *J. Infect. Dis.* 1960, Sept.–Oct., v. 107, No. 2, 155–9, 3 figs.

WARREN, L. G. **Metabolism of *Schizotrypanum cruzi* Chagas. I. Effect of Culture Age and Substrate Concentration on Respiratory Rate.** *J. Parasitology.* 1960, Oct., v. 46, No. 5, 529–39, 5 figs. [31 refs.]

FERREIRA, M. P. & ELEJALDE, P. Estudo eletroforético das proteínas séricas na forma crônica da doença de Chagas. [**Electrophoretic Study of Serum Proteins in Chronic Chagas's Disease**] *Brasil-Médico.* 1960, Feb. 6–27, v. 74, Nos. 6/9, 108–16, 10 charts.

The English summary appended to the paper is as follows:—

"The free electrophoresis technique (Tiselius) was used to study the serum proteins of eleven patients having chronic Chagas' disease interned in the Evandro Chagas Hospital (Manguinhos). Examinations, including the complement fixation test of Machado Guerreiro, were made of the cerebrospinal fluid for seven of the eleven cases.

"Ten of the sera showed abnormal concentrations of hypoalbuminemia. The alpha-2 fraction was moderately elevated in all cases, but the results of the other fractions including the total proteins did not show any important modifications.

"No abnormalities were found in any of the cerebrospinal fluids including the Machado Guerreiro test, which was negative in all cases."

DE ALMEIDA, J. O. & SIQUEIRA, A. F. Estudo da discrepância relativa entre pares de reações simultâneas de fixação de complemento no sistema moléstia de Chagas. [**Study on the Relative Discrepancy between Pairs of Simultaneous Complement-Fixation Reactions for Chagas's Disease**] *Rev. Inst. Med. Trop. São Paulo.* 1960, July–Aug., v. 2, No. 4, 204–12, 1 fig. [12 refs.]

The English summary appended to the paper is as follows:—

"Sera from Chagas' disease patients were tested with *Trypanosoma cruzi* antigens by complement fixation procedures used for testing cardiolipin, but using 3.6 units of complement. The same antigen preparation was used in pairs of simultaneous replicate complement-fixation tests. The experience with 311 observation-pairs of reactions yielded 12 inadmissible observations and the remaining 299 observations showed 153 with G-differences less than 0.010 numerically, 204 with such differences less than 0.030 and 299 with differences less than 0.070.

"Table for calculation of G was constructed for the Chagas' system by methods described elsewhere. This would indicate an expectation that about 3.82% of observations would be inadmissible and the remaining observations with G-differences less than 0.070 which defines a defective observation.

"Our present results indicate that we should expect a far lower frequency of defectives than that set as a tolerable incidence. Indeed, by these data, we can admit that the conditions for testing Chagas' antigen are not different from those prevailing in other systems, like syphilis or leprosy. This report provides a basis for the evaluation of the technical variability of the quantitative complement fixation method for determination of the specific reactivity of the immune complex.

"Several tables are appended, giving the essential data arranged as required for the purposes of the statistical analysis, and also some of the confidence intervals as estimated by distribution-free inference."

GOULD, S. E. **Geographic Pathology: Chronic Myocarditis of Venezuela.** *Amer. J. Path.* 1960, May, v. 36, No. 5, 533–57, 10 figs. on 5 pls. [52 refs.]

The clinical and pathological features of chronic myocarditis of Venezuela were investigated so that its aetiology, control and prevention might be better understood. Patients in hospital were examined and case records and slides from 100 patients and fresh tissue from 6 necropsies were examined.

Many of the patients came from regions in which Chagas's disease is known to be endemic or they gave a history of having had the disease. Most of the patients were in their fourth or fifth decades. In some the onset was sudden and caused unexpected death but in most there had been one or more attacks of congestive heart failure with generalized cardiac enlargement. Bundle branch block and atrial fibrillation were among the electrocardiographic abnormalities. Xenodiagnosis revealed *Trypanosoma cruzi* in 80% of a series of similar patients not personally observed by the author.

Macroscopic examination of the heart at autopsy revealed enlargement of all chambers and in most the region of the pulmonary conus was dilated. The wall of the left ventricle, right atrium and atrial appendage were preferred sites for thrombosis and subendocardial fibrosis. Thrombi or scarring of the myocardium or endocardium might be found in any chamber.

Microscopic examination revealed focal collections of lymphocytes in the epicardium and diffuse heavy infiltration of lymphocytes in the myocardium. There were some perivascular accumulations of cells but the arteries and arterioles showed no lesions. Passive hyperaemia and interstitial oedema were constant and inflammatory exudate usually affected the walls of all chambers. Late in the course of the disease fibrous tissue was found chiefly in the subendocardial region and inner third of the myocardium and characteristically this was diffuse and fine, differing from hypoxaemic fibrosis.

There follows a detailed discussion in which causes of the myocarditis which are excluded include dietary insufficiency, sensitization produced by drugs, bacterial and viral infections and rickettsial disease.

The conclusion is reached that the pathological, epidemiological and serological features of this chronic myocarditis of Venezuela are those of Chagas's disease. *A. W. Woodruff*

MORAES, G. E. S., FARIA, J. L. & FERNANDES, J. F. **Nucleotide and Polynucleotide Synthesis in *Trypanosoma cruzi*. V. Effects of Primaquine, Stylomycin Derivatives and Analogs, on Experimentally Infected Mice.** *Rev. Inst. Med. Trop. São Paulo.* 1960, May–June, v. 2, No. 3, 147–54, 4 figs.

Reports on the activity of Stylomycin (formerly known as Achromycin or Puromycin) against African trypanosomes and against *Trypanosoma cruzi* have

been recorded [this *Bulletin*, 1953, v. 50, 690; 1955, v. 52, 134]. This activity was reversible in some cases by purines and it therefore seemed possible that the drug was interfering with purine metabolism and led to studies by the present authors on how these purines are synthesized by *T. cruzi* [*ibid.*, 1960, v. 57, 457 *ter.*].

They found that in culture the parasite was not capable of synthesizing the purine ring, and could therefore not build up nucleotides from this base. Stylomycin apparently did not interfere with the utilization of preformed purines, but part of the molecule of Stylomycin, its aminonucleoside, could do so, and caused degeneration in intracellular forms of the parasite in culture, whereas primaquine acts on extracellular forms [*ibid.*, 1952, v. 49, 382]. A combination of these drugs has therefore been tested against *T. cruzi*, also an analogue and derivative of the aminonucleoside, but the last two were ineffective. The methods of treating infected mice were those reported earlier, and histopathological studies were made at the same time. The combined treatment with aminonucleoside plus primaquine was found very effective and there were no deaths among treated animals. Blood parasitism was markedly lowered and histological examination showed encouraging results of treatment.

J. D. Fulton

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

BERTEIN, J., BERTHARION, J. & PETITHORY, J. C. A propos de deux cas de leishmaniose ganglionnaire observés en Algérie. [**Two Cases of Glandular Leishmaniasis in Algeria**] *Bull. Soc. Path. Exot.* 1960, May–June, v. 53, No. 3, 407–11.

[See also this *Bulletin*, 1958, v. 55, 875.]

DE ALENCAR, J. E. Leishmaniase visceral no Brasil. [**Visceral Leishmaniasis in Brazil**] *Rev. Assoc. Med. Brasileira.* 1958, Aug., v. 4, No. 3, 222–36. [129 refs.]

MCMILLAN, B. **The Inhibition of Leptomonads of the Genus** *Leishmania* **in Culture by Antifungal Antibiotics.** *Ann. Trop. Med. & Parasit.* 1960, Oct., v. 54, No. 3, 293–9.

Kala azar does not naturally occur in Australia and when it is introduced is diagnosed by direct examination for parasites or by culture methods. Frequently antibiotics are added to culture material and it is here shown that while it is permissible to use penicillin and streptomycin, certain antifungal antibiotics suppressed growth of *Leishmania* in culture. This was first observed when material from bone marrow was cultured. Experiments were set up therefore

to test the effect of different concentrations of penicillin, Mycostatin and Fungizone (Squibb) and also heparin on the growth of leptomonads of different species and strains of *Leishmania in vitro*. The strains used were *L. donovani* of Indian and Maltese origin, *L. tropica* from Israel and *L. adleri* from an African lizard. The experiments were not quantitative but a certain pattern evolved and the author concluded that Mycostatin was completely inhibitory at a concentration of 25–50 units per ml. and Fungizone at a concentration of 0·01–0·05 mgm. per ml. Heparin was harmless in high concentration as were penicillin and streptomycin. *J. D. Fulton*

ZELEDÓN, R., HIDALGO R., W. & DE HIDALGO, Hilda X. Intradermoreacción de Montenegro con antígeno de *Strigomonas oncopelti*. Nota previa. **[The Montenegro Intradermal Reaction with *Strigomonas oncopelti* Antigen. A Preliminary Note]** *Rev. Biologia Trop.* San José, Costa Rica. 1960, July, v. 8, No. 1, 145–6.

Strigomonas oncopelti is a flagellate which may be cultivated on a simpler medium than that required by *Leishmania brasiliensis*. The authors, in Costa Rica, compared the use of a heterologous antigen prepared from this organism with the specific antigen of *L. brasiliensis* in intradermal reactions on 26 patients in the San Juan de Dios Hospital in San José. *S. oncopelti* was cultivated in a liquid autoclaved medium free from proteins [this *Bulletin*, 1960, v. 57, 566] and *L. brasiliensis* on NNN medium.

The flagellates were harvested at 6 and 9 days respectively, centrifuged three times in 0·9% saline and resuspended in saline containing 1/5000 merthiolate [thiomersal]. The final concentrations were 7 million parasites per ml. for *S. oncopelti* and 2·5 million per ml. for *L. brasiliensis*. Before use the antigens were tested for sterility and frozen and thawed three times.

Each patient received an intradermal injection of 0·1 ml. of each antigen and of a merthiolate-saline control. 7 were positive to both antigens and all these patients had parasitological and clinical histories of cutaneous leishmaniasis. At 48 hours 5 of them were + + + and 2 were + +. The reactions persisted at 72 hours and in one case became more intense. Intensity of reaction was not related to the type of antigen. Further details and more extensive trials will be published later. *H. J. O'D. Burke-Gaffney*

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

BOVARNICK, Marianna R. & SCHNEIDER, L. **Role of Adenosine Triphosphate in the Hemolysis of Sheep Erythrocytes by Typhus Rickettsiae.** *J. Bacteriology.* 1960, Sept., v. 80, No. 3, 344–54, 2 figs. [12 refs.]

[See this *Bulletin*, 1948, v. 45, 986.]

ABD-EL-MESSIH, G. **Subclinical Infections of Epidemic Typhus in Egypt. Their Origin and Magnitude.** *J. Egyptian Pub. Health Ass.* 1960, v. 35, No. 2, 35–62, 2 charts. [24 refs.]

This interesting paper presents the results of three serological surveys for complement-fixing antibodies to *Rickettsia prowazeki*: (1) a survey in 1955, in which 16·4% of 1,034 sera collected in 12 villages in an area (Qalyub) where epidemic typhus had occurred during 1940–45 gave positive reactions (titre of 1 in 8 or more); (2) another in 1957, in which 109 sera from 2 of the 12 villages included in the 1955 survey were tested; of 63 sera in one village giving negative reactions in 1955, 17 (26·9%) gave positive reactions in 1957; in the other, 8 of 26 were positive; (3) a survey in 1958, in which 24·5% of 448 sera from a province (Behera) where typhus had recently been active gave positive reactions.

The incidence of positive reactions with sera from persons of various ages suggested that subclinical typhus infections had been occurring both in areas with recently reported cases of typhus and in those where the disease was not being recognized; subclinical infections appeared to have been spreading in a familial pattern. It seemed likely that recrudescent typhus cases had been responsible for initiating both subclinical and clinical foci of infection. The results are tabulated and discussed at length. *R. S. F. Hennessey*

PSHENICHNOV, V. A., LEVASHOV, A. A. & NIKOLENKO, V. I. **Biological Characteristics of the Vaccine Strain E of** *Rickettsia prowazeki*. **(Observations on the Immunization of Human Subjects with Live Typhus Vaccine.)** *Problems of Virology*. London. 1959, v. 4, No. 6, 64–70. [Translated from Russian.]

Inoculation of 63 persons with a living vaccine prepared from the E strain of *Rickettsia prowazeki* (the inoculum containing 2,500 ED50 egg infective doses) caused no local reactions and relatively slight general reactions. Reactions were completely absent in 7 out of 8 subjects who had been given a single dose of a killed typhus vaccine 10 days before inoculation with the living E strain. Tests on sera taken from 33 subjects before inoculation and between the 20th and 30th day after inoculation showed that complement-fixing antibodies had developed in all cases (21 sera were from subjects who had previously received killed typhus vaccine on one or more occasions). Antibodies to *R. mooseri* were found in 24 of the sera tested. Attempts to infect lice by feeding them on vaccinated subjects during the time when the clinical reaction was most marked were unsuccessful. *R. S. F. Hennessey*

LEPEŠ, T. J. **Susceptibility of Body-Lice to DDT in a Heavily Treated Area of Yugoslavia.** *Bull. World Health Organization*. Geneva. 1960, v. 22, No. 5, 515–18, 2 figs.

"Body-lice collected in the Kosohovo-Metohia area of Yugoslavia, an area with a long history of epidemic typhus and one which had been treated with

DDT since 1947, were tested for their susceptibility to that compound by the standard WHO test and showed an average mortality of 99% to 1·0% DDT and 96% to 0·1% DDT. Freshly fed insects showed 100% mortality at both concentrations. Tests with DDT-impregnated cloth indicated that the LD50 had tripled between 1955 and 1958.

"In sleeve tests the body-lice appeared to tolerate 15 times as much DDT as in tests not involving the use of the human arm. Tests were also made to ascertain the effect of lowered temperature on reducing mortality from DDT, and the speed of kill with DDT was compared with that with BHC and pyrethrins."

HAHN, F. E., COHN, Z. A. & BOZEMAN, F. Marilyn. **Metabolic Studies of Rickettsiae. V. Metabolism of Glutamine and Asparagine in** *Rickettsia mooseri*. *J. Bacteriology*. 1960, Sept., v. 80, No. 3, 400–405, 3 figs. [15 refs.]

YAMAGUCHI, T. **Studies on Tsutsugamushi in Shikoku (2). Distribution of Trombiculid Mites in Shikoku.** *Tokushima J. Exper. Med.* 1960, Feb., v. 6, No. 4, 275–82, 9 text figs. & 18 figs. on 4 pls. [12 refs.]

After the discovery of an endemic focus of tsutsugamushi disease in the island of Shikoku in Japan in 1951 [MORIKAWA and YAMAGUCHI, this *Bulletin*, 1955, v. 52, 1068; 1957, v. 54, 669] an extensive survey of the trombiculid mites of the area was undertaken from 1953 to 1958. Of the 1,664 hosts trapped and examined for mites, *Apodemus speciosus*, the wood mouse, was the most abundant, followed by *Rattus norvegicus*. The other rodents and insectivores examined were *Apodemus geisha, Anthelionomys smithi, Urotrichus talpoides, Talpa micrura* and *Crocidura russula*. A total of 63,993 mites belonging to 4 genera and 20 species were collected from these hosts; these, together with previous records, bring up the trombiculid fauna of Shikoku to 7 genera and 29 species. The most prevalent species were *Trombicula* (*Leptotrombidium*) *kitasatoi* followed by *Trombicula* (*L.*) *fuji* and *Gahrliepia saduski*. *Trombicula* (*L.*) *tosa*, the suspected vector, was collected only from 2 areas along the coast as well as from the neighbouring island of Awaji. *Trombicula* (*L.*) *pallida*, a vector species elsewhere, was collected from almost all localities in Shikoku.

Nine text figures show the spot distribution of some of the species and photomicrographs (many of them by phase contrast microscopy) illustrate 16 species. *M. G. R. Varma*

POWELL, O. **"Q" Fever: Clinical Features in 72 Cases.** *Australasian Ann. of Med.* 1960, Aug., v. 9, No. 3, 214–23, 6 figs. [14 refs.]

Since the original description by DERRICK [this *Bulletin*, 1938, v. 35, 62] of Q fever in abattoir workers and dairy farmers in south-east Queensland an extensive literature has grown up. This fever has increased in incidence in

Queensland over the past 3 years. This increase was in part due to involvement of the sheep industry, but particularly to the recent development of the packaged beef trade with the U.S.A. There has, however, also been an increased incidence in the known endemic areas.

The paper is based on a consecutive series of 72 cases of Q fever diagnosed in the public wards of the Princess Alexandra Hospital, Brisbane, over a period extending from late July 1958 until early June 1959. All the patients were males. Of the total, 64 were abattoir workers, 2 were workers in shearing sheds, 5 came from a wool-scour, and one was a dairy farmer.

Diagnosis in all cases was confirmed by the demonstration of complement-fixation antibodies to *Rickettsia burneti*: either a rise in titre from zero to 1 in 32 or more, or a titre in a single specimen of 1 in 256 or higher was considered diagnostic.

There were no deaths. The commonest symptoms were headaches and anorexia. Myalgia, sore eyes, cough, chills and sweats were frequent. The commonest clinical signs consisted of a relative bradycardia, hepatomegaly and splenomegaly. Minor respiratory signs were frequent. The total duration of the fever was 10 days or less in the majority. The longest duration of continued fever was 24 days and of intermittent fever 34 days. The most common laboratory findings included increased erythrocytic sedimentation rate, the presence of atypical mononuclear cells in the acute stage and an absolute lymphocytosis during convalescence. Only 3 patients had radiologically demonstrable pneumonic changes. Lower grade respiratory infections were frequent and this suggests that local strains of *R. burneti* may be less virulent than those from overseas. Subclinical involvement of the liver was noted and in 7 there was electrocardiographic evidence of a transient myocardiopathy.

Some 70% of patients returned to work within 6 weeks from the onset. The duration of convalescence was prolonged with increasing age.

In this series there were some cases complicated by pneumonia, pleural effusions, thrombocytopenia, encephalitis and even endocarditis.

It is concluded that the chief aspect in which this series differs from other reported outbreaks of Q fever is this incidence of pneumonia. It is true that no cases of pneumonia occurred in Derrick's original series, and it has always been open to the criticism of inadequate X-ray control. However, even in the present series, in which chest radiography was employed as a routine, only 3 patients had pneumonic changes. One factor may be a difference in the manner of infection. Respiratory, as distinct from pneumonic, involvement is not uncommon, as shown by the number who developed bronchitis.

Too much should not be attributed to electrocardiographic abnormalities. These go to show that Q fever is but another of the many infective processes in which transient myocardiopathy occurs. On the other hand liver damage is frequent. The importance of a protracted or chronic form of the disease cannot be emphasized too strongly.

Most local physicians are generally inclined to doubt the effectiveness of specific therapy. Most of the patients in the series were in fact untreated.

An attempt was made to evaluate the effect of chloramphenicol at a dose of 2 gm. daily in a small series of patients admitted to hospital: there was no difference in the duration of fever, but a properly controlled trial is needed. 7 illustrative case histories are given. *Philip Manson-Bahr*

MARMION, B. P., HIGGINS, F. E., BRIDGES, J. B. & EDWARDS, A. T. **A Case of Subacute Rickettsial Endocarditis; with a Survey of Cardiac Patients for this Infection.** *Brit. Med. J.* 1960, Oct. 29, 1264–7, 1 fig.

A previous publication of the case record of a patient suffering from Q fever, who subsequently developed an infection with *Rickettsia burneti* on his aortic valves [this *Bulletin*, 1960, v. 57, 235], led the authors to investigate the sera of 56 patients clinically diagnosed as suffering from infective endocarditis, in the Leeds district. In 13 of them a bacterial aetiology had already been established, in 8 stabilized valvular damage alone was diagnosed, but in 35 there was strong clinical evidence of active infection though repeated blood cultures were sterile.

From the whole group 2 patients showed antibodies to rickettsiae. The serum of one of these, who had never left the British Isles, gave a CF antibody titre of 1 in 128 to a rickettsial-pox group-specific antigen. Further investigation suggested that he was suffering from a bacterial, not a rickettsial, endocarditis, and the interesting possibility that he had had previous contact with an organism of the rickettsialpox group in Britain is under investigation. Details of the fatal illness of the second patient are given in full. He was a man of 48 years, who gave no history of an illness resembling Q fever when he was first admitted to hospital suffering from a right-sided hemiparesis attributed to carotid artery occlusion. At this time, in June 1957, though the heart appeared radiologically to be enlarged, signs of a valvular lesion were not found and there was no evidence of endocarditis. He made an incomplete recovery and returned to light work 5 months after discharge. 16 months after his first admission, a series of right-sided convulsions led to his readmission to hospital, where cardiac enlargement, an aortic valvular lesion, an enlarged left auricle and finger-clubbing were discovered. The urine contained albumin and numerous red cells, and later a nephritis of Ellis type 2 developed. Repeated blood cultures proved sterile and he showed no response to massive penicillin or to steroid therapy. Albuminuria, anaemia and a raised sedimentation rate persisted.

8 months later, in May 1959, he showed congestive cardiac failure with clear evidence of aortic and mitral valvular lesions and auricular fibrillation, and at this stage the possibility of a rickettsial endocarditis was first considered. His serum showed an antibody titre to the phase 1 CF antigen of *R. burneti* of 1 in 256, and of 1 in 64 to the phase 2 CF antigen. *R. burneti* could not, however, be cultured from his blood.

On his death in August 1959 from progressive renal failure a complete autopsy was carried out. This confirmed the presence of endocarditis over the aortic and mitral valves, also the Ellis type 2 nephritis, but showed no evidence of embolization. Rickettsia-like organisms were seen in thick aggregations lying deeply in a collagenous matrix within the mitral valve: these were clearly independent of any tissue cells. *R. burneti* was recovered from the mitral valve, but not from other tissues, by a painstaking process of serial passage through guineapigs.

The authors point out that in patients whose disease strongly suggests infective endocarditis but in whom conventional blood cultures remain sterile, a search for rickettsial antibodies may occasionally be rewarding. *J. H. Walters*

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

HALLAUER, C. & KRONAUER, G. Nachweis von Gelfiebervirus-Haemagglutinin in menschlichen Explantaten. [**The Demonstration of Yellow Fever Virus Haemagglutinin in Human Explants**] *Arch. f.d. gesamte Virusforschung.* 1960, v. 10, No. 2, 267–87, 6 figs. [23 refs.]

In attempts to demonstrate haemadsorption in cultures of human cells (HeLa, KB and FL) infected with tissue culture lines of the 17D and Asibi strains of yellow fever virus it was found that treatment of the infected cells with phosphate buffer would liberate a haemagglutinin for goose red cells. The best conditions for extracting the haemagglutinin were obtained by treatment with *p*H 8·7–9·0 borate buffer. Haemagglutinin could also be demonstrated in the culture fluid after treatment with Freon to remove unspecific inhibitors. Haemagglutination would only take place at *p*H values between 6·4 and 7·0; the same titres were obtained at 4°C. and at room temperature (20°C.), but haemagglutination did not take place at 37°C. Haemagglutinin could only be found in cultures which had been rolled; it appeared in the cells before any cytopathic effect was observed, and the titre rose in parallel with the infectivity titre, reaching a maximum at the time of general cell destruction.

[See also this *Bulletin*, 1960, v. 57, 803.] *D. J. Bauer*

COLLIER, W. A. & DE WIT, M. **Immunization Experiments in Mice with Dead or Neutralized Yellow Fever Virus.** *Trop. & Geograph. Med.* Amsterdam. 1960, Sept., v. 12, No. 3, 258–62, 4 graphs. [15 refs.]

Earliest efforts at securing the active immunization of man or monkey against yellow fever had been largely directed towards the inactivation, by chemical or physical means, of the virus intended for use as vaccine. All such efforts had, however, proved unsuccessful, no chemical or physical method having been found capable of eliminating the pathogenic, and at the same time retaining the antigenic, properties of the virus. The aims of the present investigation were to ascertain (i) whether better results with chemically or physically changed virus might not be obtained in white mice than in man or monkey, and (ii) whether, as in the case of man and monkey, satisfactory immunization of white mice could be achieved by a combination of active yellow fever virus and immune serum, *i.e.* by a serum-neutralized virus. In the experimental work described, the yellow fever strains used were the 17D (chick-embryo vaccine) strain and the neurotropic Asibi strain from mouse brains. For chemical inactivation, 40% formaldehyde and β-propiolactone were employed, 0·4% dilutions of these compounds in physiological saline being prepared immediately before use and added in equal quantities to the virus.

As regards (i): for the immunization of mice a 1 in 25 suspension of 17D vaccine virus in 1% bovine albumin was prepared and divided into 4 portions, A, B, C and D. In A, the virus suspension was diluted with equal parts of 1% bovine albumin, for immunization with live virus. In B, the virus suspension

was diluted with equal parts of 1% bovine albumin and kept for 1 hour at 56°C., for immunization with heat-inactivated virus. In C, the virus suspension was diluted with equal parts of 0·4% β-propiolactone and kept for 2 hours at about 4°C., before being used for immunization. In D, the virus suspension was diluted with equal parts of 0·4% formalin and kept for 72 hours at 20°C., after which it was used for immunization. 4 groups of mice were immunized intraperitoneally with 2 doses, each of 0·5 ml., of the above suspensions, a 7-day interval separating the doses. The virus suspensions in B, C and D inoculated intracerebrally in 0·02 ml. amounts into white mice were used to ascertain that the virus was no longer infective and did not cause clinical symptoms. 11 days after immunization all the mice were challenged intracerebrally with serial ten-fold dilutions of 17D virus; a group of control mice was similarly challenged. Results showed that immunization with live virus had induced a very high degree of immunity, whereas immunization with inactivated virus had practically no protective effect; only in the group immunized with virus pre-treated with formalin was a very slight effect observed.

As regards (ii): in the immunization experiments with neutralized virus, different, large, fatal doses of the Asibi strain were mixed with different large doses of a human immune serum, the mixtures being introduced intracerebrally into a large series of mice. Among the mice, which survived the infection and in which, therefore, it may be assumed that the virus had been completely neutralized, 3 groups were challenged intracerebrally with serial ten-fold dilutions of 17D virus 2, 3 and 4 weeks, respectively, after successful immunization. Results showed that in all 3 groups distinct, if relatively weak, immunity had been induced by pre-treatment with neutralized virus. *G. Stuart*

MEERS, P. D. **Further Observations on 17D-Yellow Fever Vaccination by Scarification, with and without Simultaneous Smallpox Vaccination.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Sept., v. 54, No. 5, 493–501.

The finding of a very low level of immunity to yellow fever among Lagos schoolchildren led to the decision to institute a large-scale vaccination programme, with the 17D mouse brain scratch yellow fever vaccine produced at Yaba. This decision, affecting some 60,000 children, in need also of protection against smallpox, afforded the opportunity for carrying out the experiments described in the present paper. Inasmuch as the use of a combined smallpox-yellow fever vaccine (the two viruses being mixed and freeze-dried together in the same ampoule) had been shown in an earlier trial by the author [this *Bulletin*, 1959, v. 56, 820] to confer protection against yellow fever in only 64·5% of persons previously non-immune to that disease, it was decided to use the present opportunity to test the simultaneous administration of smallpox and yellow fever vaccines at separate sites. It was also decided, in an effort to increase the 85±5% conversion rate reported by the author [*ibid.*, 1957, v. 54, 1311] to follow a single vaccination of non-immune persons to yellow fever by scratch with 17D vaccines, to vaccinate one group of schoolchildren twice by this technique, allowing an interval between vaccinations.

In the present series of experiments the vaccines used were: a Lister-type dried smallpox vaccine which, after reconstitution, was applied by the multiple pressure method to a single site; and a 17D mouse brain yellow fever vaccine of which, after reconstitution with 2% gum arabic solution, 0·02 ml., representing an average dosage per child of 16,000 LD50, was applied by a vaccinostyle

to the skin of the arm over the deltoid at two sites about 2·5 cm. apart. The children selected for the trial were over the age of 10 years and divided into 4 groups. Children in group A were vaccinated simultaneously on opposite arms with the two vaccines, inspected 7 days later for smallpox reaction, and bled 28 days after vaccination to obtain serum for protection testing. Children in group B were vaccinated twice by the scarification technique with yellow fever vaccine alone, an interval of 14 days separating the two vaccinations, and were bled for protection testing 28 days after the second vaccination. Children in group C were vaccinated as in group B, but without the second vaccination; blood specimens were collected from half the group after 28 days and from the other half after 42 days, for comparison of protection test results with those from group A and from group B, respectively. Children in group D were vaccinated with an inert substance and from them, as well as from 59 in groups A, B and C just before their vaccination, blood specimens were collected and used for estimating the pre-vaccination level of yellow fever immunity among the children participating in the trial. For detecting the presence or absence of yellow fever antibodies in the sera collected, SMITHBURN's intra-peritoneal test in immature mice was employed. In order to determine whether the vaccination procedures had caused any serious reactions, the school attendance registers for the children involved were examined for the 21 days following vaccination and any absences recorded. The main results of the investigations follow.

In group A: of 398 children vaccinated against smallpox 375 (94·2%) showed a positive reaction; the results of yellow fever protection tests on the sera collected from 213 children showed 199 (93·42%) to be positive. In group B: the yellow fever protection test was positive in the sera of 303 (98·1%) of the 309 children twice vaccinated. In group C: among 165 of the 28-day specimens of sera 159 (96·4%) gave positive protection tests and among 127 of the 42-day specimens 117 (92·1%); a combination of these results, so as to give a single set of figures for group C, shows that of 292 sera 276 (94·52%) gave positive protection tests. In group D: among the 200 sera tested only 10 (5%) were found to be positive. From the results of these protection tests the actual yellow fever conversion rates from the non-immune to the immune state produced by each of the vaccination procedures described may be calculated by correcting each of the results obtained in groups A to C for the pre-existing immunity rate found in group D. Thus calculated, the results are 93·1% in group A, 98% in group B and 94·2% in group C. As regards reactions: examination of the school registers having failed to reveal any significant difference in missed attendances between groups A, C and D, it was concluded that no large-scale reactions had followed simultaneous vaccination with smallpox and yellow fever vaccines; in the light of this conclusion, simultaneous vaccination with the two vaccines was performed on over 60,000 children between the ages of 5 and 15 years without any reported ill-effect.

The above results showed that both yellow fever and smallpox vaccines could be applied at separate sites, without any reduction in the efficacy of either immunizing agent and without signs of any serious reactions among over 60,000 children involved. The double yellow fever vaccination fully protected 98% of children previously non-immune, while the single scratch yellow fever vaccinated group, with 94·2% conversions from negative to positive, gave a result somewhat better than the $85 \pm 5\%$ previously obtained.

In this latter connexion it is suggested that in the areas in which trials have been carried out in the past there has been a high rate of immunity to viruses antigenically related to the yellow fever virus (principally other arthropod-borne viruses of Casals group B), resulting in the development of cross-reacting antibodies which might prevent or modify an infection with the 17D virus [*ibid.*, 1959, v. 56, 819]. *G. Stuart*

De Meira, M. T. V. Erradicação do *Aedes aegypti* na ilha de S. vicente (Arquipélago de Cabo Verde). [**Eradication of *Aedes aegypti* in the Island of Saint Vincent, Cape Verde Archipelago**] *Anais Inst. Med. Trop.* Lisbon. 1959, Jan.–Dec., v. 16, Nos. 1/4, 209–12.

In 1952–53 every house on the island of Saint Vincent was sprayed with DDT to control *Anopheles gambiae.* This spraying was repeated in 1954–55. In 1952, the *Aedes aegypti* index had been 3·9.

Neither larvae nor adults of *Aedes aegypti* have been found on the island since September 1954 and it is therefore considered that the island is outside the receptive area for yellow fever. *H. J. O'D. Burke-Gaffney*

Bearcroft, W. G. C. **Cytological and Cytochemical Studies on the Liver Cells of Yellow-Fever Infected Rhesus Monkeys.** *J. Path. & Bact.* 1960, July, v. 80, No. 1, 19–31, 26 figs. on 4 pls. [48 refs.]

With the aid of photomicrographs of a very high standard, the author describes the sequence of cell changes, studied by cytological and cytochemical methods, which occurred in the livers of 18 rhesus monkeys infected with the Asibi strain of yellow fever virus in the Virus Research Unit, West African Council for Medical Research, Yaba, Nigeria. Liver biopsies were carried out (under ether anaesthesia) before infection and at intervals after infection until death (79–177 hours after inoculation); further liver samples were examined at necropsy immediately after death.

The first change was increased synthesis of ribonucleic acid (RNA) protein, primarily in the nucleolus and later in the cytoplasm, where it is thought to be concerned with virus multiplication. In the nucleus degenerative changes occurred, causing a breakdown of chromatin and the collection of deoxyribonucleic acid (DNA) on the nuclear membrane; the proteins precipitated to form the Torres inclusion bodies, which did not appear to contain virus or be concerned in virus multiplication; they contained histones, lipoproteins and a variety of amino-acids but not nucleic acids, carbohydrates or free fats. Degenerative changes in the cytoplasm consisted of loss of the Golgi apparatus, progressive degeneration of the mitochondria, rapid depletion of glycogen, increase of neutral lipids, and finally loss of RNA. *D. A. Cannon*

RABIES

Brygoo, E. R. & Sureau, P. La rage à Madagascar de 1901 à 1958. [**Rabies in Madagascar from 1901 to 1958**] *Arch. Inst. Pasteur de Madagascar.* 1960, v. 28, 61–96. [24 refs.]

FENJE, P. **Propagation of Rabies Virus in Cultures of Hamster Kidney Cells.** *Canadian J. Microbiol.* Ottawa. 1960, Oct., v. 6, No. 5, 479–84.

The SAD strain of fixed rabies virus was used. Trypsinized hamster kidney cells were grown in Hanks solution with 0·5% lactalbumin hydrolysate and 15% human or horse serum.

Dialyser tubes were used in which cells could be cultured for up to 10 weeks without disturbance as medium changes were made in an internal dialysis tube containing 25 ml. of medium to 10 ml. in contact with the cell monolayer. In nutrient medium without cells $10^{4.5}$ mouse IC LD50 disappeared in 3–4 days. In ordinary cultures survival extended to 9 days but virus multiplication was not demonstrated. In dialyser tubes the titre of the culture fluid (determined by mouse inoculation) fell from 4·5 log initially to 2·5 log after 24 hours; it then rose to a maximum of 7·0 log after 23–29 days, falling to 2·7 log after 62 days. 7 serial passages in hamster kidney cells were made: in the 7th passage the culture fluid titred 6·0 log after 15 days' incubation. [Alternate passage in mice and hamster kidney cells was also used but it is not clear where this is relevant to the experiments described in detail.] The virus was identified in a neutralization test after 5 hamster kidney cell passages. The virus [after ? number of passages] showed no change in pathogenicity for mice but did give an increased incubation period in rabbits [? after the same dose]. Negri bodies were not found in the brains of the mice and rabbits. No cytological change was observed in infected hamster kidney cells even after 3 weeks. [See also this *Bulletin*, 1958, v. 55, 1319; 1960, v. 57, 897.] *C. E. Gordon Smith*

ROSS, H. D. **The Submission of Appropriate Tissue for the Postmortem Laboratory Diagnosis of Suspected Human Rabies.** *Central African J. of Med.* 1960, Sept., v. 6, No. 9, 408–10, 4 figs.

Doctors in those parts of Africa where human rabies is fortunately rare are aware of the need for a speedy and accurate post-mortem diagnosis of deaths suspected to be due to that dread disease: many are equally conscious of the difficulty for them (so often, as the author writes, "separated by some years from the dissection room") of obtaining exactly the right material for the demonstration of Negri bodies. This material consists of nervous tissue from the hippocampal gyrus or Ammon's horn.

Shortly, but with admirable clarity and the support of 4 excellent photographs, the author (a morbid anatomist from the Ministry of Health, Federation of the Rhodesias and Nyasaland) describes, step by step, the local anatomy, removal and section of the brain and exposure and identification of the hippocampus. A rectangular block of this tissue from each side is cut out; one block is placed in formalin, for section, and the other in glycerine for virus identification. The author points out that the fact that there are two allows one to make a trial approach on one side and improve one's technique on the other if necessary. The better specimen should be placed in formalin, since rough handling may gravely handicap histology without interfering with the viability of the virus.

The author warns that handling of such material is potentially dangerous and rigidly careful mortuary hygiene is essential. In particular, no one concerned should handle any such contaminated material with ungloved hands.

H. J. O'D. Burke-Gaffney

SVET-MOLDAVSKY, G. J., SVET-MOLDAVSKAYA, I. A. & KISELEVA, I. S. **Preparation of Allergen-Free Vaccines against Transmissible Encephalitides and Rabies from the Brain of Suckling Mice and Rats.** *Acta Virologica.* Prague. 1960, Sept., v. 4, No. 5, 320–22. [11 refs.]

[An abstract of this paper appeared in the *Bulletin of Hygiene*, 1961, v. 36, 93.]

SELIMOV, M. A., BOLTUCIJ, L. G. & SEMENOVOVA, J. V. Dynamik der Virusneutralisierenden Antikörper im Blut von schwer gebissenen und mit Gammaglobulin und der Antirabies-Vakzine geimpften Menschen. **[Course of Appearance of Neutralizing Antibody in the Blood of Severely Bitten Persons treated with Gamma Globulin and Rabies Vaccine]** *J. Hyg., Epidemiol., Microbiol. & Immunol.* Prague. 1959, v. 3, No. 4, 487–500.

The authors have investigated the rabies neutralizing antibody content of the serum in persons bitten by rabid wolves and other animals and treated with Fermi vaccine and antirabies gamma globulin given separately or in combination. In 6 persons given vaccine alone antibody was present in titres of 27–58 after 17 days, reaching a maximum of 97–370 after 37 days, and persisting for 455 days in 4 instances. 15 persons who had been given 6–15 cc. of gamma globulin after being bitten by non-rabid animals only developed low antibody titres. The antibody titres observed over a period of 1½ years in 42 persons bitten by rabid animals and treated with 1–7 doses of gamma globulin in combination with rabies vaccine are presented in detail in tables. Some delay in the course of active immunization was observed during the combined treatment, but satisfactory antibody titres were obtained, which persisted for up to 1½ years in many cases. None of the persons treated developed rabies.

D. J. Bauer

NIETO, D. & ESCOBAR I., A. Estudio clínico y neuropathológico de los accidentes provocados por la vacunación antirrábica. **[Clinical and Pathological Study of Accidents Resulting from Antirabies Vaccination]** *Bol. Inst. Estud. Med. y Biol.* 1959, v. 17, No. 1, 27–41, 3 figs. [43 refs.] English summary.

A general account, discussion, review of the literature and details of 3 cases.

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

BONEBAKKER, A. **Plague.** *Trop. & Geograph. Med.* Amsterdam. 1960, Mar., v. 12, No. 1, 47–53. [16 refs.]

Plague is a disease of rodents transmitted by their ectoparasites, usually *Xenopsylla cheopis*, the domestic rat being the principal reservoir. An epidemic

of human plague is always preceded by one among rats, and it is only when the ranks of the latter have been depleted that the fleas leaving the dead rats attack man for lack of another rodent host. This is likely to occur only in underdeveloped tropical countries where man lives in intimate contact with the animal reservoir.

There are however other environments where man may become involved, for example where field rats visit human dwellings after the crops are harvested in search of food and so may become infected by ectoparasites from the domestic rats and give rise to sporadic cases among field workers.

Plague may also occur independently among wild rodents which have no contact with human habitations (*selvatic* or *sylvatic* plague). An example of this is found in the wilds of Manchuria and Tibet, where plague is endemic among tarbagans (*Arotomys bobac*), which are hunted for their pelts. This may result in sporadic cases of bubonic and perhaps of primary pulmonary plague among the hunters; the latter may give rise to disastrous epidemics when the hunters are crowded together in their winter quarters.

Sylvatic plague also occurs in other parts of the world, for example in Colorado and Texas, and in California where ground squirrels and other wild rodents have been found infected. In South Africa plague was introduced *via* the ports during the Boer war, and small human epidemics occurred. After these had burned out it was found that a number of species of wild rodents in extensive areas were suffering from epizootics or enzootics of plague. This again has resulted from time to time in occasional sporadic cases in man.

Where the inhabitants of a country cover themselves warmly in winter and seldom wash, as in Morocco, they are prone to become heavily infested with fleas and lice. In such cases, although the permanent reservoir is a rodent, the disease may spread directly by ectoparasites from man to man.

Special attention is drawn to the situation in the Butembo and Blukwa regions of the eastern Congo, where sylvatic plague is rife and the jungle inhabited by wild rodents adjoins human settlements and their arable lands. Human plague occurs sporadically in these areas. *Rattus rattus* has already invaded the interior along one of the arterial roads and has obtained a firm footing in certain centres of population. An epizootic among these domestic rats might well give rise to a serious epidemic of human plague. Several other points are made, with reference to the literature. *G. Covell*

DODIN, A. & BRYGOO, E. R. Étude quantitative de l'utilisation des sucres par *Pasteurella pestis* souche E.V. en suspension non proliférantes. II. Le glucose. Autodestruction, à 37°, du pouvoir de dégrader le glucose pour les germes cultivés à 26°. [**Quantitative Studies on Glucides Utilization by *Pasteurella pestis* Strain EV, in Non-Proliferating Suspensions. II. Glucose. Disappearance at 37° of the Capacity to split Glucose by the Organisms cultivated at 26°**] *Ann. Inst. Pasteur.* 1960, May, v. 98, No. 5, 676–81, 2 figs.

Suspensions of *Pasteurella pestis*, Strain EV, which was grown at a temperature of 26°C., were stored at 37°C. for 24 hours and it was found that they no longer were able to split glucose. It was observed, however, that if such a suspension was filtered, the filtrate, when added to an active suspension grown

at 26°C. in the presence of glucose, could augment respiration. With the active suspension alone the QO_2 was 88 microlitres but with the added filtrate the figure was 224.

[For Part I, see this *Bulletin*, 1960, v. 57, 31.] *H. J. Bensted*

BRYGOO, E. R. Immunité du hérisson et du tanrec à la peste expérimentale. [**Immunity of the Hedgehog and the Tenrec to Experimental Plague**] *Arch. Inst. Pasteur de Madagascar.* 1960, v. 28, 47–52.

See this *Bulletin*, 1931, v. 28, 878.

MOHAN, B. N. **A Note on High DDT Tolerance in Rat Fleas collected from Gundlupet Town of Mysore State.** *Indian J. Malariology.* 1960, Mar., v. 14, No. 1, 19–21.

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

SOUTH-EAST ASIA TREATY ORGANIZATION (SEATO). **Cholera Research Laboratory. Report for the Fiscal Year ending 30 June 1960.** 13 mimeographed pp., 1 map & 6 figs. 1960. Bangkok, Thailand.

The quarterly report of the Cholera Research Laboratory, Bangkok, published in 1960 covering the period December 1959 to February 1960, contained the essential details of the organization of this unit and set out an ambitious and comprehensive research programme [this *Bulletin*, 1960, v. 57, 1058]. The present report deals mainly with routine bacteriological examinations of waters, foodstuffs and the stools of various groups of children and adults for the presence of cholera vibrios, non-agglutinable (NAG) vibrios, salmonella and shigella organisms and the results of these examinations are set out in a number of tables. During the period under review the cholera epidemic itself came to an end and by the end of June 1960 human carriers were rarely found but contaminated water and food supplies continued to be discovered. Salmonella and shigella infections were, however, common and were responsible for much of the diarrhoea seen in hospitals.

There appears to have been little true research undertaken, mainly owing to lack of staff and the very heavy burden of the routine work, but a great amount of material has been collected and it is hoped to investigate this as soon as the opportunity occurs. Some of the material has already been sent to other cholera research centres where it has proved to be of considerable value in investigations being undertaken there. *H. J. Bensted*

COCKBURN, T. A. & CASSANOS, J. G. **Epidemiology of Endemic Cholera.** *Pub. Health Rep.* Wash. 1960, Sept., v. 75, No. 9, 791–803, 6 figs. & frontispiece.

Cholera has been known as a distinct entity since 1817, when it appeared in Calcutta in severe epidemic form and spread rapidly around the world in a great pandemic that was repeated 5 times in the nineteenth century. These pandemics eventually died away, leaving no permanent foci outside Asia. In the twentieth century these Asian foci became restricted to one or two sharply localized areas. The disease no longer exists in Russia, China, Japan, the Philippines, Indonesia or Ceylon, except when introduced from outside. In Thailand it appears for about 3 years at a time, but then is not seen for 5 to 7 years. The only region where it has been found with regularity all the year round, year after year, has been the Indian subcontinent. Only Bengal remains a permanent focus and it is concluded that should the infection be eliminated from Bengal, it would almost certainly disappear from the world.

In the year 1947 Bengal was divided between India and Pakistan, and the eastern half is now East Pakistan. West Bengal has an enormous urban population centred on Calcutta, while East Pakistan is predominantly rural in character. The terrain and habits of the people are described. Cholera occurs in Bengal all the year round in both the rural areas and in Calcutta, but the authors believe that the endemic infection is primarily rural and that the urban region is of secondary importance. The feature which sets the cholera vibrio apart from all other intestinal pathogens is its capability of thriving in highly alkaline media. The organism can multiply at a *p*H of 9·2 and probably survive for long periods at a much higher *p*H. As the result of weekly observations in 6 tanks carried out over a 12-month period it is concluded that in hot, dry weather algae in the village water tanks raise the *p*H of the water so high that the cholera vibrio is favoured over all other organisms, and that the tanks are the chief factor in its spread. The eradication of cholera from Bengal, and therefore from the world, depends largely on the success of the Pakistani and Indian Governments in replacing the village tanks by a source of safe water.

Epidemiology and analytical procedures used are discussed and the findings set out in figures and tables. *G. Covell*

ABOU-GAREEB, A. H. **Experimental Study of Cholera Vibrio Strains in Tank Waters.** *J. Trop. Med. & Hyg.* 1960, Aug., v. 63, No. 8, 192–4.

It is well recognized that during an epidemic of cholera the serological type of *Vibrio cholerae* may appear to change from one sub-type to the other. At the beginning of an outbreak all the strains isolated may be identified as Inaba sub-type, but later on Ogawa strains may appear.

This paper describes an attempt to reproduce the change artificially by some laboratory experiments with tank waters from which Inaba and Ogawa strains of cholera vibrios had previously been isolated but from which they were later found to be free [this *Bulletin*, 1960, v. 57, 472], and the strains themselves. By using a cellophane-bag technique the strain originally isolated from a particular tank water was re-inoculated into the now vibrio-free water and then sampled daily. It was found, in one experiment for instance, that an Inaba

strain re-introduced into a water from which it was originally isolated changed to an Ogawa type within a period of 4 days. In other instances the change appeared to be more gradual; an Ogawa strain appeared to change to a Hikojima type (responding to both Ogawa and Inaba monospecific sera) by the 4th day, but between the 6th and 7th days only specific Inaba strains were isolated.

[The experiments are not described as clearly as they might be.]

H. J. Bensted

BHASKARAN, K. **Recombination of Characters between Mutant Stocks of *Vibrio cholerae*, Strain 162.** *J. General Microbiol.* 1960, Aug., v. 23, No. 1, 47–54. [12 refs.]

[This paper has been reviewed in the *Bulletin of Hygiene*, 1961, v. 36, Feb. See also *Bull. Hyg.*, 1959, v. 34, 1053.]

FINKELSTEIN, R. A. & RANSOM, J. P. **Non-Specific Resistance to Experimental Cholera in Embryonated Eggs.** *J. Exper. Med.* 1960, Aug. 1, v. 112, No. 2, 315–28, 4 figs. [29 refs.]

The embryonated hen's egg at 11 days is highly susceptible to infection with minute doses of cholera vibrios, the embryo dying within 24 hours. As small a dose as a single vibrio was found to be capable of infecting and killing embryos of 11 days of age within 3 days. Embryos 13 days old were more resistant to death within 24 hours; 15-day-old eggs were markedly resistant and death within 3 days only occurs regularly when the infecting dose is in the region of 5×10^8 or more. This is in confirmation of the observations of other workers.

Escherichia coli varies considerably, according to the strain used, in its power to kill chick embryos. Some strains are highly virulent while others have a very low virulence; this is entirely unrelated to their human enteropathogenicity. One strain of O–111 inoculated allantoically into 11-day-old chick embryos in doses of about 10^5 cells failed to kill any one of 5 embryos in 2 days. When graded doses of this strain were inoculated into 12-day-old embryos and 24 hours later they were further inoculated with the cholera vibrios it appeared that the pre-inoculation with *E. coli* had conferred a marked protective effect. Similarly killed suspensions and endotoxin preparations also conferred this protective effect. It would appear that the pretreatment with *E. coli* induces a phase of vibrio-stasis in the 13-day-old egg which may be sufficient to tide the embryo over into the phase of relative insusceptibility associated with the increase in age. These observations are of considerable interest and the chick embryo may well prove to be a valuable tool for further studies of this nature.

H. J. Bensted

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

FERRARA, Antonino. L'amoeboma. Morfologia, patogenesi e patologia di confine. [**Morphological and Pathological Studies of Amoeboma**] 139 pp., 64 figs. 1960. Bologna: L. Cappelli, Italy. [L. 3000.]

This term is used for certain inflammatory growths found in the colon and attributed to amoebic action. RADKE [this *Bulletin*, 1956, v. 53, 592] carried out an investigation in 1955 and ascertained that a total of 119 cases of the condition had been reported from various countries up to that time. The incidence has been mostly in known endemic foci of amoebiasis in (1) South America—Argentina, Brazil and Uruguay, (2) Panama, (3) the Philippines, (4) Indo-China, (5) Hawaii, (6) Palestine and (7) Libya and other parts of North Africa.

The present monograph comes from the Institute of Pathology in the University of Messina, Italy, and is based on a series of 14 cases. The tissues examined came directly and fresh from the operating theatre. The author gives notes on each case in an appendix, which also includes the laboratory findings on the histology of sections of suspected amoeboma tissue taken from 9 other patients.

The majority of the patients were male both in Radke's series (84 out of 92) and in Ferrara's (12 out of 14). In the latter series, 3 were aged under 20 (12, 17 and 18), 9 were 20–40 and the remaining 2 were 55 and 58. The condition affected the caecum in every case with additional involvement of the ascending colon in 3, the transverse colon in 5 and the sigmoid, the rectum and the ileal mesentery in one case each. The largest nodules were about the size of a man's fist. To the feel they had an elastic hardness with one or more softer spots: when cut through they were of a fleshy consistency. There is a tendency to colliquative necrosis inside the nodule but this does not break through into either the peritoneal or the intestinal cavity. The paper has illustrations of the macroscopic and microscopic appearance of sections from selected specimens. Figure 23 on page 50 gives a diagrammatic representation of 6 varieties of form which the amoeboma may assume.

The history of some of the patients lacked any direct evidence of amoebic infection, but amoebiasis may reveal itself indirectly as by certain changes in the intestinal flora and by their effect, say, on the digestion of the cellulose in vegetable foodstuffs. The exact relationship between bacteria and amoebae inhabiting the same host bowel is not clearly understood: the former, *e.g. Clostridium welchii*, play an important part in causing amoebic cysts to develop into the vegetative form. Amoebae may lead a saprophytic existence for a lengthy period in a human host before they attack the mucosa and produce ulceration with dysentery, and hyperplastic growths in some cases: bacterial factors may also play a part in this transition from saprophytism to parasitism in some hosts.

The author discusses the possible pathogenetic significance of circulatory, lymphoidal, metabolic, allergic, hormonal and other factors in the aetiology

of an amoeboma. "Eosinophilic granuloma" of the caecum may well have been a mistaken diagnosis for an amoeboma. To help differentiate a malignant granuloma of the intestine the author sets down 4 characteristics of this condition. Crohn's disease [a chronic inflammation of the last 12–14 inches of the ileum which is followed by cicatrization and often ends in obstruction] may be associated with amoebiasis without being an amoeboma. Inflammatory pseudotumours, polyposis and carcinoma of the colon may also have to be differentiated from an amoeboma.

The points in favour of a diagnosis of amoeboma include (1) its basic localization in the caecum, (2) the presence of nodules in the large intestine with freedom of the ileum from involvement, and (3) necrotic degenerative changes inside the growth without any break-through into either bowel or peritoneal cavities and without involving the mucosa. The appearance and characters of any fluid found inside the nodule are important and so are the presence of amoebic ulcers or other evidence of amoebiasis. The author refers to some complications of amoeboma. *J. Cauchi*

POWELL, S. J. & NEAME, P. B. **A Case of Amoebic Brain Abscess.** [Memoranda.] *Brit. Med. J.* 1960, Oct. 15, 1136–7, 3 figs. [13 refs.]

Brain abscess is a rare complication of amoebiasis [this *Bulletin*, 1947, v. 44, 903; 1949, v. 46, 1034; 1951, v. 48, 152]. The present authors, from the Amoebiasis Research Unit in Durban where severe amoebiasis is very common in Africans, report a case in a previously healthy African aged 35. He woke one morning, 4 hours before admission, with numbness, weakness and involuntary movements involving the right side of the body and limbs. Examination of the cerebrospinal fluid did not suggest any specific infection and the hemiparesis was at first attributed to cerebral thrombosis. On the third day the temperature rose to 102°F. and the patient passed dysenteric stools containing trophozoites of *Entamoeba histolytica*. Brain abscess was suspected and the patient was treated with a battery of anti-amoebic drugs. Lumbar puncture now showed 48 lymphocytes and 80 polymorphonuclear cells per cmm.; protein had increased from 200 mgm. to 400 mgm./100 ml. with a marked increase of globulin. Culture was sterile.

The dysentery improved, but the hemiparesis became more severe and stupor developed on the sixth day. Cerebral angiography indicated a space-occupying lesion in the temporo-parietal region. The patient died 8 hours later.

A yellow exudate was seen at autopsy on the leptomeninges of the left parietal lobe. Thick yellowish-green material escaped as the brain was removed. There was a left temporo-parietal abscess containing yellowish-brown exudate and necrotic brain tissue. The cavity extended from the midline to the lateral wall of the cortex. The abscess wall was ragged and no limiting membrane was seen. Fresh preparations of the abscess contents showed numerous motile *E. histolytica*. Amoebae were also found in microscopic sections. The appearances are shown by a photograph and 2 photomicrographs. 2 ulcers of about 1 cm. diameter were found in the caecum and 2 small nodules in the rectum. Despite the typical appearance, no amoebae were found in them. The lung, liver and kidney showed no abnormalities.

The authors refer briefly to 2 other presumed cases, one in an infant of 5 months and one in a man of 47. Both had an associated liver abscess, which is usual, and both died despite anti-amoebic therapy. In the present case there was no hepatic or pulmonary involvement and the diagnosis was only considered when the patient developed amoebic dysentery. The condition might be recognized more frequently if fresh preparations of brain abscesses were examined in all cases in an endemic area. It is suggested that amoebae may reach the brain by way of the paravertebral plexus of veins.

The prognosis of amoebic brain abscess is extremely grave. It is noted that in the present case, motile amoebae were found in the abscess contents after 4 days of anti-amoebic treatment. While emetine and chloroquine are concentrated in the liver there is no evidence that they reach amoebicidal concentration in the brain [*ibid.*, 1948, v. 45, 960; 1949, v. 46, 1035]. It is doubtful whether any of the present drugs have any effect on the condition.

H. J. O'D Burke-Gaffney

DORE, P. Effetto di un derivato dicloroacetamidico nell'amebiasi e nella giardiasi intestinale. [**The Effect of a Derivative of Dichloroacetamide in Amoebiasis and Intestinal Giardiasis**] *Parassitologia.* Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 155–7.

The English summary appended to the paper is as follows:—

"Eight patients suffering from amebiasis showed regression of the symptoms and disappearance of *E. histolytica* from the stools after administration of Mebinol. Negative results were on the contrary obtained by administering the same drug to ten patients parasitized by *Giardia intestinalis*."

ABDALLAH, A. & SAIF, M. **Chlorophenoxamide in the Treatment of Acute Intestinal Amoebiasis.** *J. Egyptian Med. Ass.* 1960, v. 43, No. 5, 293–7.

The authors, from the Institute of Research for Tropical Medicine, Cairo, discuss briefly the use of Mebinol [this *Bulletin*, 1960, v. 57, 707] with some reference to the literature.

They then describe the treatment of 23 patients aged 19–56 with proved intestinal amoebiasis. Each patient received 500 mgm. Mebinol three times daily for 10 days. Full clinical and laboratory tests were carried out during and after treatment. Stools were examined daily during treatment and thereafter twice a week for the first month and once a week for the next 2 months. The parasitological criterion of cure was absence of *Entamoeba histolytica* in 3 consecutive samples, each consisting of 5 microscopic preparations.

All but one patient improved clinically by the 4th to 6th day of treatment and the stools became negative by the 3rd to 7th day. 4 patients relapsed within 1 to 4 weeks. The other 18 remained free of symptoms and of amoebae in the stools for the whole period of 3 months. The twenty-third patient remained positive and was without clinical benefit throughout.

No side effects or evidence of liver, kidney or haemopoietic damage were noted.

H. J. O'D. Burke-Gaffney

SHALDON, S. **Entamide Furoate in the Treatment of Acute Amoebic Dysentery.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Sept., v. 54, No. 5, 469–70.

Entamide furoate was used for the treatment of 4 Nigerian soldiers with acute amoebic dysentery. One had had some emetine injections 6 months previously, but otherwise they had had no treatment for the condition. The dosage of the drug was 30 mgm./kgm. of body weight (in 4 doses) by mouth daily for 10 days. All were symptom-free within 5 days. One patient suffered a mild temporary oesophagitis on the 6th day of treatment but apart from this there were no side effects. All were allowed to become ambulant on becoming symptom-free. Stool examinations on the 12th, 14th and 16th days after the start of treatment failed to yield parasites. Re-examination after 6 weeks by stool examination and sigmoidoscopy failed to yield any evidence of a persisting infection.

Entamide furoate is less soluble than is the parent substance [this *Bulletin*, 1956, v. 53, 995; 1958, v. 55, 162]; it therefore may be absorbed from the gut more slowly; this may account for its superior therapeutic action in intestinal amoebiasis. If on further trial it proves to be as non-toxic and as effective as already it seems to be it will possess obvious advantages over emetine-bismuth-iodide, a most effective drug but with the defect of toxicity and a resultant need for bed occupation. *A. R. D. Adams*

MOFFETT, H. F. & TOH, S. H. **The Treatment of Amebic Dysentery with Paromomycin (Humatin). A Preliminary Report.** *Antibiotic Med.* New York. 1960, Sept., v. 7, No. 9, 569–70.

The authors, in Korea, treated 40 adult patients suffering from confirmed amoebic dysentery (12 acute, 5 fulminating, 23 chronic relapsing) with Humatin [this *Bulletin*, 1959, v. 56, 1238; 1960, v. 57, 245 *bis*, 812 *bis*] in a daily dose of 1·5 gm. (2 x 250 mgm. capsules thrice daily) for 5 days.

Stool examinations and sigmoidoscopy were done and repeated weekly for 3 weeks after treatment. Blood and urine analyses were made before and after treatment.

All 40 patients improved promptly; diarrhoea and gross blood in the stools disappeared in 3 to 5 days and ulceration improved in every case after treatment. In 4 patients, clinical improvement was not sustained and stools remained positive for trophozoites or cysts re-appeared in them. Of these 4 failures one was an acute and 3 were of the chronic type. There were no significant side effects or appreciable changes in the blood or urine.

H. J. O'D. Burke-Gaffney

KARAPETJAN, A. E. [**Method of Cultivation of** *Giardia*] *Citologia.* Moscow-Leningrad. 1960, v. 2, 379–84, 7 text figs. [11 refs.] [In Russian.]

Up to the present, all attempts to grow *Giardia intestinalis in vitro*, both on artificial media and in tissue culture, have failed. In this paper the author describes the first successful method for the cultivation of this flagellate. Having found that in most cases of infection examined *Giardia* was accompanied by

yeast-like fungi of the genus *Candida*, and sometimes *Torulopsis*, it seemed that there might be some symbiotic relation between the flagellates and the fungi. Acting upon this assumption, the author isolated *Giardia* from the duodenal contents and successfully cultivated it together with *Candida guilliermondi*. At the time of writing, the culture had passed through more than 20 subcultures in the course of 7 months.

The medium is represented by 2 variants: (1) for the initial isolation of *Giardia*, composed of 25% inactivated human serum + 5% chick embryo extract (in Hanks or Earle solution) + 10% chick amniotic fluid + 60% Hanks solution; (2) for maintenance, composed of 20% human serum + 5% chick embryo extract + 25% Hottinger's digest [tryptic meat digest] + 50% Earle solution. In both cases the mixture is filtered through Seitz filter, after which 250 units/ml. penicillin and 100 units/ml. streptomycin are added, to prevent growth of extraneous bacteria, and the reaction (usually *p*H 7·6–8·0) is adjusted to *p*H 7·3–7·5 by passing CO_2 through the fluid, and finally the medium is dispensed in insulin bottles, to the walls of which the flagellates attach themselves.

For cultivation, the flagellates are obtained by duodenal drainage from untreated patients. In order to concentrate the flagellates and to remove traces of bile, 1 part of duodenal contents is diluted with 2 parts Hanks solution and centrifuged at 600–1,000 r.p.m. for 10 minutes, then the supernatant fluid is discarded, 2–3 ml. of the salt solution are added to the sediment, and the tube is shaken and re-centrifuged, this procedure being repeated 3–4 times. After the last centrifugation 1–2 ml. of Hanks solution are added to the sediment, which is broken up, and 0·2–0·5 ml. amounts of suspension are placed into insulin bottles containing medium (1), previously seeded with fibroblasts which had been allowed to proliferate there. The bottles are plugged with rubber corks and incubated at 37°C., reclining at an angle of 5–7°.

The growth of *Giardia* in the bottles can be observed directly, under low magnification of the microscope. At first the flagellates settle at the bottom and attach themselves to the fibroblasts; they multiply rapidly from the 4th–5th day onwards, but after 7–12 days the fibroblasts are gradually destroyed, while the flagellates and fungi continue to grow. On the 2nd day after incubation 1 ml. of medium (1) is added to the bottle, and subsequently a half or a third of the culture fluid is daily replaced by fresh medium, and at the same time the sediment consisting of fungi is pipetted off, leaving the flagellates attached to the wall. After a time the wall of the bottle may be obscured by the formation of a film consisting of lipids and fungi, but this can be removed by addition to the culture of 2–3 drops of ethyl alcohol, which does not damage the flagellates. When the density of flagellates reaches 100,000 per ml., half of the fluid is replaced by fresh medium, the bottle is vigorously shaken, to displace the flagellates from the wall, and a subculture is inoculated into medium (2). Attempts to grow *Giardia* in the absence of *Candida* were unsuccessful, thus if the fungi are killed by the antibiotic nystatin, the flagellates in culture die out.

The role played by *Candida* in the cultivation of *Giardia* is not known, but it is thought that in the course of fermentation the fungi discharge into the medium nitrogens, sterols and vitamins of B complex, which probably promote the growth of these flagellates. In view of these observations, it is suggested that fungicidal antibiotics (*e.g.* nystatin) might be effective in the treatment of giardiasis.

The paper is illustrated by photomicrographs showing the growth of *Giardia* in culture. *C. A. Hoare*

PRASAD, H. **Studies on the Coccidia of some Rodents of the Families Muridae, Dipodidae and Cricetidae.** *Ann. Trop. Med. & Parasit.* 1960, Oct., v. 54, No. 3, 321–30, 19 figs. [34 refs.]

"1. The literature on the coccidia of the rodents of the families Muridae, Cricetidae and Dipodidae is reviewed.

"2. Three new species of *Eimeria* and one new species of *Isospora* are described:

(i) *Eimeria egypti* sp. nov. and *Isospora egypti* sp. nov., from the merion *Meriones shawi shawi*.

(ii) *Eimeria sylvatica* sp. nov. (of which the endogenous stages also are described), from the long-tailed field-mouse *Apodemus sylvaticus*.

(iii) *Eimeria cricetomysi* sp. nov., from the giant rat *Cricetomys gambianus*."

RELAPSING FEVER AND OTHER SPIROCHAETOSES

GRÜN, F. & BLATTER, C. Zur Organotropie der Rückfallfieber-Spirochäte *Borrelia duttoni* Novy et Knapp in der Zecke *Ornithodorus moubata* Murray. Versuch einer Kennzeichnung der Substanz, welche die Organotropie verursacht. [**Organotropism of** *Borrelia duttoni* **in** *Ornithodoros moubata*. **Studies of the Substance Originating Organotropism**] *Helvetica Chimica Acta.* Basle. 1960, Oct. 17, v. 43, No. 6, 1690–99, 3 figs.

The English summary appended to the paper is as follows:—

"Experiments by Geigy and Sarasin on the organotropism of Spirochetes are interpreted with the use of a diffusion model."

[See this *Bulletin*, 1960, v. 57, 38.]

HEISCH, R. B., SPARROW, M. D. H. & HARVEY, A. E. C. **The Behaviour of** *Spirochaeta recurrentis* **Lebert in Lice.** *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 140–43.

The authors used a strain of *Spirochaeta recurrentis*, isolated in Abyssinia during the WHO expedition in 1955 and afterwards maintained by Hélène SPARROW at the Pasteur Institute of Tunis, by passage from louse to louse [this *Bulletin*, 1956, v. 53, 1238, 1429]. Large numbers of normal female lice were fed on patients infected with this strain and up to 5 lice were examined daily. In two experiments the lice were kept at 34°C. and in one experiment at 28°C. Large numbers of spirochaetes appeared in the coelomic fluid, in one case only 6 hours after the infective feed, and the numbers of organisms rapidly increased and persisted in the haemocele as long as the lice were

examined, up to the 17th and 18th day. There was no negative phase as described by NICOLLE *et al.* [*ibid.*, 1912, v. 1, 32]. In one infected louse 3,000 spirochaetes per drop of haemocoelic fluid were counted on the 8th day and on later days sometimes as many as 15 to 25 thousand organisms per drop were observed. These numbers are very much higher than those obtained with tick-borne strains examined by HEISCH *et al.* [*ibid.*, 1958, v. 55, 896] and also as a rule heavier concentrations of tick-borne spirochaetes in the patient's blood were necessary to obtain infection in lice: in the present experiments, only 1 or 2 *S. recurrentis* per field were necessary. *Edward Hindle*

YAWS AND OTHER TREPONEMATOSES

HACKETT, C. J. & LOEWENTHAL, L. J. A. **Differential Diagnosis of Yaws.** *World Health Organization Monograph Series No. 45.* 88 pp., 52 figs. on 52 pls. [37 refs.] 1960. Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery Office.] [17s. 6d.; $3.25; Sw.fr. 10.–.]

This monograph is a companion to *An International Nomenclature of Yaws Lesions* [Hackett, this *Bulletin*, 1958, v. 55, 656] which has been accepted as a standard atlas of yaws. The present monograph is a most welcome atlas of those conditions which may simulate yaws. The accurate differentiation of other conditions from yaws becomes increasingly important as yaws eradication schemes approach success, for such cases may incorrectly be recorded as failures. Good illustrations, with an explanatory text, are given of such conditions as impetigo contagiosa, ecthyma, leprosy, scabies and tungiasis ("jiggers"), pityriasis rosea, psoriasis and other diseases liable to be confused with early or late yaws. The most frequent mistake is to attribute other plantar lesions to the hyperkeratosis of yaws. The avoidance of this error has already been stressed by TURNER [*ibid.*, 1960, v. 57, 248]. The present authors discuss and illustrate lesions of the sole in great detail and in a useful annex attempt a summary of the complex and somewhat confused literature surrounding the terms "keratoma plantare sulcatum" and "keratodermia punctata". The 52 photographs maintain the high standard set in the previous monograph.

[A most valuable addition to the literature on yaws. In the bibliography the initials of Turner should read L. H.] *Frederick J. Wright*

VARELA, G. Conocimientos epidemiologicos acerca del mal del pinto o carateo. [**Epidemiological Aspects of Pinta**] *Salud Pública México.* 1960, July–Sept., v. 2, No. 3, 507–9. [25 refs.]

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

DHARMENDRA. **Notes on Leprosy.** pp. vi + 203, numerous illustrations. 1960. India, Govt. of: Ministry of Health.

Despite its modest title, this book is one of considerable size. It contains over 200 pages of print, and also 47 plates with 283 figures. Most of these are either photographs of clinical lesions or photomicrographs, in black and white; but there are also a few colour photomicrographs and some excellent reproductions of paintings of the eye. The *Notes* are based upon the material that the author had been using for teaching in the DTM course at the Calcutta School of Tropical Medicine. In the historical section (page 1) it is mentioned that though leprosy had been prevalent since ancient times in India, China and Africa, it is only in the literature of India, in Sushruta Samhita (600 B.C.), that a reasonably good account of the clinical features and treatment are given.

It is estimated (page 5) that there are about 1½ million cases of leprosy in India according to recent surveys. The estimated rate of incidence per thousand in the 11 states of India is given, rising from 0·11 in the Punjab and 1·4 in Uttar Pradesh to 14·1 in West Bengal. The areas of high incidence are mostly found in the eastern part of the country.

Under Aetiology (page 7) it is said that Sushruta in 600 B.C. considered that leprosy was spread by touch and breath of patients, sharing the same bed, eating and drinking from the same vessel, and using the same clothes. Although only 1 of Koch's 3 postulates is fulfilled, most workers believe that Hansen's bacillus is the causative organism of leprosy.

The clinical manifestations are next described succinctly and the descriptions made clear by reference to the many excellent photographs of lesions. Regarding lepra reaction in lepromatous patients, the cause (page 29) " Does not appear to be of allergic nature. Exact cause not known; may be a toxic process, may occur naturally without any apparent cause or may be precipitated by excessive doses of anti-leprotic drugs, administration of potassium iodide, or intercurrent disease ".

After a short note on general pathology (page 36), the histopathology of the various types of leprosy is given and illustrated by photographs. It is remarked however that only 1 out of the 4 types described, namely the lepromatous, is specific for leprosy.

The section on diagnosis explains and illustrates the various methods of examination, and it is followed by an excellent sub-section on differential diagnosis. No fewer than 18 diseases are described which may be mistaken for leprosy because of the appearance, and 10 others which resemble leprosy because of neural changes.

The classification of leprosy is according to the system adopted by the Indian Association of Leprologists, which divides the disease into 6 forms or classes: lepromatous (L), tuberculoid (T), maculoanaesthetic (MA), polyneuritic (P), borderline (B), and indeterminate (I). The reasons for adopting this system in preference to previous systems are argued in detail.

Under Prognosis (page 80) it is emphasized that "The earlier the patient comes under treatment the more favourable is the prognosis".

Epidemiology (page 83) is dealt with under: source of infection, methods of transmission, conditions favourable to the spread of the disease, and the susceptibility of the host. It is concluded that the evidence produced by some workers on the infectivity of "closed" cases is not convincing, and anyway that they are much less infective than "open" cases.

Treatment (page 93) occupies 37 pages, by far the longest section. It begins with hydnocarpus oil, stating that "Although the general use of the oil and its preparations in the treatment of leprosy has been discontinued, local injections with these drugs may be indicated for special purposes". The sulphones are discussed under: history, chemical composition, metabolism, mode of action, and the sulphone drugs in common use. DDS is mentioned as the preparation of choice, given preferably by the oral route. Where a depot effect is desired so that treatment may be given at long intervals, an oily suspension of DDS may be given intramuscularly or a watery solution of sulphetrone or novotrone. The therapeutic results, toxic effects and complications, and the limitations of treatment are next discussed. It is considered that "After an apparent 'cure' or 'arrest' of the disease, a small maintenance dose should be continued for a long period". Several other antileprosy drugs are commented on: thiosemicarbazone, INH, thiourea derivatives (DPT combined with DDS may give better results than either drug alone), thiol compounds, and certain antibiotics such as streptomycin. Next is considered the treatment of special symptoms, particularly lepra reaction with special reference to neural and ocular inflammations. There are subsections on nasal symptoms, necrosis of bones, trophic ulcers and deformities. More detailed discussion is given to physiotherapy, and a short description is given of the objectives (but not the technique) of reconstructive surgery.

The section on prevention is of particular value, and although it is based upon methods worked out and adopted in India, the same or similar methods may be found of value in other underdeveloped countries. There is room here only to mention the headings under which these methods are discussed: (1) the chief stress is laid upon extensive treatment with sulphones, wide-scale arrangements being made for home treatment, case-finding, and follow-up of patients; (2) sulphone therapy to healthy contacts—this should be on an experimental basis as its efficacy has not yet been proved; (3) health education regarding leprosy to patients, relatives and the public at large; (4) protection of children by arranging for their care by healthy relatives, or if necessary in institutions; (5) BCG vaccination; but this also must be on a well-planned experimental basis. While the need for isolation of open cases is still acknowledged as necessary, the chief stress is placed on early diagnosis and thorough treatment.

The last section deals with social services in leprosy with methods to be adopted for rehabilitation of patients, particularly those who have been driven to maintaining themselves by begging. The book ends with a number of useful appendices.

Notes on Leprosy is a book which should be in the hands of all doctors and social workers engaged in a campaign against leprosy. For anyone who wishes to gain a thoroughly practical (though not encyclopaedic) working knowledge of leprosy it can be highly commended. It is clearly written,

excellently illustrated and well reproduced. Unfortunately there are a number of *errata*, though the majority of these are corrected at the end of the text.

Ernest Muir

RODRIGUEZ, J. N. **Report of a WHO-Supported Leprosy Survey, 1957, of the British Solomon Islands.** *Internat. J. Leprosy.* Wash. 1960, Apr.–June, v. 28, No. 2, 155–66. 1 map.

Previous surveys had been made by Ross INNES in 1937–38 [this *Bulletin*, 1938, v. 35, 882] and by AUSTIN in 1952 [*ibid.*, 1953, v. 50, 419]. The former estimated the prevalence rate of leprosy at 10·2 per 1,000 after examining 21,615 people.

The total population of the 10 large and many small islands is 94,000 Melanesians, 4,350 Polynesians, 590 Europeans, 250 Chinese, and 10 other Asiatics.

The survey here reported was a joint leprosy and yaws survey under the auspices of WHO–UNICEF. The itinerary included the visiting of the Government leprosarium on Guadalcanal, and various Mission and other leprosaria and leprosy villages on 6 of the larger islands. The objects in view were to value the qualifications of the personnel, classify the types of cases, find out the methods of treatment, re-examine cases of leprosy found by the yaws teams, examine samples of the population for leprosy. Beginning in 1956 the teams had by September 1957 found 303 new cases. 85% of cases are of the tuberculoid type. It is recommended that more leprosy villages be established where the patients can be treated and that "a repository injectable DDS preparation would seem to be the method of choice in the Solomon Islands". So far as the survey has gone there are 1,078 known cases of leprosy listed for some of the larger islands, making a percentage prevalence of 1·46 as compared with Ross Innes's 1·02. Results of the survey are set out and tabulated.

Ernest Muir

MONTESTRUC, E., GARCIN, D., BENOIST, J., BERDONNEAU, R. & MILLE, R. La lèpre à la Martinique en 1959. **[Leprosy in Martinique in 1959]** *Arch. Inst. Pasteur de la Martinique.* 1960, July–Oct., v. 13, Nos. 3/4, 72–89.

In a review of the endemicity of leprosy in Martinique over the years from 1954 to 1959 the author finds 5 reasons for real though cautious optimism. (1) The proportion of patients with the tuberculoid type, representing the resistant form of the disease, has increased from 11·8% to 43·5%. (2) The number of patients under 20 years old has decreased. (3) The proportion of bacteriologically positive patients in the hospital has increased from 38 to 92%. (4) The percentage of those under control who have become bacteriologically negative has increased. (5) The results obtained by the supervision of foci of infection, and the raising of resistance by BCG vaccination give ground for hope that leprosy will be eradicated from Martinique. Evidence of the above is given in 11 tables. During 1959 not only was there a smaller number of new patients, but those registered were increasingly of the resistant type, and borderline cases are becoming more common in place of lepromatous.

What is required is that all those means for the control of leprosy which have been used since 1954 be continued so that in a few years' time the prophylaxis of leprosy may be brought to a successful issue.

Ernest Muir

MONTESTRUC, E. Fréquence et classification des infirmités chez les malades atteints de lèpre à la Martinique. Considérations sociales, thérapeutiques et épidémiologiques. [**The Frequency and Classification of Infirmities among the Leprosy Patients in Martinique. Social, Therapeutic and Epidemiological Considerations**] *Arch. Inst. Pasteur de la Martinique.* 1960, July–Oct., v. 13, Nos. 3/4, 90–98.

An enquiry showed that out of 589 leprosy patients 115 had a slight incapacity, 58 had a medium degree of incapacity, 24 had a still greater degree, and 7 had total incapacity. Of the whole 589 patients, 200 had to receive social aid, and 171 received from 1,200 to 4,980 francs a month. It is pointed out that if the number of open cases continues to diminish it will be better to treat at home the new closed cases, or those who may rapidly become closed. Attempts should be made by means of surgery and physiotherapy to remedy the deformities as much as possible. It is considered that in judging the endemicity of leprosy the presence of deformities in the community should be used as a most important index.

Details are tabulated. *Ernest Muir*

NOLASCO, J. O., LARA, C. B. & IGNACIO, J. L. **Histologic Examinations of Tissues of Children with Healed Primary Lesions of Leprosy. Report of Seven Cases.** *Internat. J. Leprosy.* Wash. 1960, Apr.–June, v. 28, No. 2, 133–9.

The object of this study was to look for the presence of lesions in superficial lymph nodes and nerve trunks of children who had recovered clinically from primary leprosy skin lesions. Those examined were 7 children born of leprous parents at the Culion leprosy colony in the Philippines. The average age at death was 12 years 5 months, after an average interval of 10 years 9 months from the first appearance of lesions. The average age at onset was 1½ years. All the findings were absolutely negative. Although it was impossible to carry out an exhaustive search for bacilli, the authors "consider that the method of study, together with the regular clinical observations and concurrent laboratory findings, sufficiently justifies the opinion that the first leprosy infection in these children had been completely overcome". *Ernest Muir*

SILVA, C. & TUMA, M. Polissacárides séricos nos diferentes tipos e fases da lepra. [**The Polysaccharides of the Serum in the Various Types and Phases of Leprosy**] *Rev. Brasileira Leprologia.* São Paulo. 1960, Mar., v. 28, No. 1, 17–21. English summary.

The sera of 17 normal persons, 11 tuberculoid type patients, 37 lepromatous patients not in a state of reaction, and 23 reacting lepromatous patients, were

tested to determine the amount of polysaccharides, by means of the Seymour Cohen method with tryptophan-perchloric acid. In the first of these the values, in Klett units, varied from 74 to 110 with an average of 88·58; in the second from 77 to 112 with an average of 98·18; in the third from 76 to 137 with an average of 105·59; and in the fourth from 128 to 194 with an average of 159·13. The respective deviations were 12·8, 13·55, 14·73, and 18·55.

It is concluded that the amount of serum polysaccharides in leprosy patients is slightly above normal, that it does not differ between lepromatous and tuberculoid types of leprosy, but that it increases in lepra reaction in proportion to the severity of the reaction. *Ernest Muir*

MUELLING, R. J., Jr., GOETZ, Catherine & ROSS, Hilary. **Serum Protein Patterns in Leprosy, I. Carville Survey.** *Internat. J. Leprosy.* Wash. 1960, Apr.–June, v. 28, No. 2, 144–54, 3 figs. [13 refs.]

The patients whose sera were examined were 143 of the lepromatous type (98 active) and 17 tuberculoid (6 active). Sera were examined for serum protein by chemical fractionation and by electrophoresis. The methods employed are described in detail. The results of chemical fractionation showed the following mean values for the patients: total protein 8·84, albumin 3·39, total globulin 5·33, alpha globulin 1·15, beta globulin 1·90, gamma globulin 2·28. The corresponding mean values for normal sera were respectively: 6·97, 4·08, 2·88, 0·77, 1·11, 1·01.

With electrophoretic fractionation in the 98 active lepromatous patients the commonest occurrence was an elevation in the gamma region, and the next most common was a beta-gamma increase; lipoprotein was not remarkable; 45 gave a normal mucopolysaccharide pattern, while 53 had elevation and abnormal patterns. In the 30 inactive lepromatous patients only 4 had normal curves, the aberration being in the total protein pattern. In lepromatous patients with amyloidosis the total protein fluctuated according to the amount of albumin in the urine.

There is no absolutely diagnostic curve or pattern in leprosy. The determination of lipoprotein is not helpful, but the mucopolysaccharide element appears to be related to bacteriological positivity and may give an interesting insight into this disease, as its elevation must have some relationship to the metabolism of the leprosy bacillus. *Ernest Muir*

MONTESTRUC, E. **The C-Reactive Protein in the Serum of Lepromatous Cases in Lepra Reaction.** *Internat. J. Leprosy.* Wash. 1960, Apr.–June, v. 28, No. 2, 140–43.

This study was carried out in 49 patients with lepromatous leprosy, some of them reacting and others not. The chief method employed was the antigen-antibody reaction between immunized rabbit serum (anti-CRP serum) and the human serum to be tested. This reaction is highly specific.

It was found that C-reactive protein (CRP) is always present in the serum of patients with lepromatous leprosy who are in a state of lepra reaction, and the reaction of this protein is higher in reactional patients who have not been given cortisone. CRP is absent in cured reactional patients, and it is suggested that in reacting patients hormone treatment should be continued until CRP has entirely disappeared. In lepromatous patients without reaction CRP was

found in only 9% of patients, and in low concentration. CRP and the red-cell sedimentation rate run parallel, and both are of use in controlling lepra reactions.

[See also this *Bulletin*, 1959, v. 56, 621; 1960, v. 57, 482.] *Ernest Muir*

BEASLEY, W. B. R. **Lepromin-Like Reactions to Normal Tissue Antigens.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Sept., v. 54, No. 5, 459–65. [39 refs.]

After detailing previous work done on this subject [see, for example, this *Bulletin*, 1956, v. 53, 1005; 1957, v. 54, 577; 1958, v. 55, 770; 1959, v. 56, 450], the author describes his own experiments. He used three antigens: Lowe's modification of Mitsuda lepromin, normal skin antigen and cardiac muscle antigen. In reading the results of the Mitsuda lepromin the Madrid Congress standard was used; in reading the other two an experimental standard was used (2 mm. induration for the early reaction, and 1 mm. induration for the late). The patients in the experiment consisted of 14 lepromatous patients (7 tuberculin positive and 7 negative), 5 tuberculoid patients and 3 dimorphous. A control group of 14 students contained 8 with positive tuberculin reactions and 6 negative or unknown.

The results in the 14 lepromatous patients were all negative, early and late, to both the trial antigens. Of the 3 dimorphous patients 1 was lepromin positive and 2 were lepromin negative; there was no reaction to either of the trial antigens by the Madrid standard, but 2 had early but not late reactions with the two test antigens, by the experimental standard. In the tuberculoid group (2 tuberculin positive) all were lepromin positive; there was no reaction to the cardiac antigen; of the 3 in this group who came for early reading, 1 was positive to the normal skin antigen (experimental standard), and 1 was positive at the late reading.

In the control group those with positive tuberculins gave no early reactions; there were 6 positive late reactions to true lepromin but none to the other two antigens. In the tuberculin-negative group 33% gave positive Mitsuda tests, while in the tuberculin-positive group 75% gave positive Mitsuda tests. With the experimental standard 28% gave positive early reactions with cardiac antigen but no late reactions; with normal skin antigen 35% gave early reactions and 28% late.

A correlation was found between trial skin antigen and true lepromin in late reactions, which agrees with previous reports, but cardiac muscle antigen does not give promising results. *Ernest Muir*

DAVISON, A. R., KOOIJ, R. & WAINWRIGHT, J. **Classification of Leprosy. I. Application of the Madrid Classification of Various Forms of Leprosy.** *Internat. J. Leprosy.* Wash. 1960, Apr.–June, v. 28, No. 2, 113–25, 7 figs. **II. The Value of Fat Staining in Classification.** *Ibid.*, 126–32.

With a view to testing the efficiency of the Madrid Congress classification, it was applied in 182 leprosy patients, chiefly Bantu. The patients were observed for 1 to 3 years and reclassified if the original classification was found to be incorrect. Originally there were 53 lepromatous cases, but only 36 of them remained lepromatous, 7 of them being finally classed as reacting tuberculoid,

1 as tuberculoid and 9 as borderline. Of the 49 originally borderline, 7 became lepromatous, 23 reacting tuberculoid, and 19 remained borderline. Of the 12 indeterminate cases, 8 became tuberculoid.

It is concluded that the Madrid classification is a workable one, but it needs improvement and simplification. The authors would prefer the term "leprid" to "tuberculoid", as tuberculoid histological structure, which is sometimes absent, would not be essential. They would prefer that the term "macule" be used only in the dermatological sense. Perhaps the "incipient flat lesions of childhood" could be brought under leprid as a special clinical variety, and if necessary other clinical varieties also. *Ernest Muir*

WADE, H. W. **The First Phase of Borderline Transformation. The So-Called "Relapsed Tuberculoid" Condition.** *Internat. J. Leprosy.* Wash. 1960, Apr.–June, v. 28, No. 2, 105–12, 6 figs.

This is the first of two articles to be published on borderline leprosy and has the object of making clear photographically "the clinical appearance of a case, originally tuberculoid, considered to be in the first stage of transformation toward borderline". The patient photographed and described is an 18-year-old girl who had 10 years previously suffered from what appears to have been a major tuberculoid lesion on the left cheek, which had healed leaving partial paralysis of the lids of the left eye. Relapse occurred with development of a large plaque covering most of the same cheek, but with an "immune" area at the site of the original lesion. The infiltration and elevation were most marked in the immediate neighbourhood of that area and abutted abruptly upon it, while the lesion tapered off gradually to the level of the normal skin.

The last feature is held to distinguish the borderline type from the reacting tuberculoid, as illustrated by 2 other patients of whom photographs are also given. In both of these (by way of contrast) the lesions show an abrupt raised margin abutting on the surrounding normal skin.

In the borderline patient the bacteriological examination of the lesions was negative and the lepromin reaction positive (5 mm.). Later, following on irregularity of treatment, the patient apparently became an advanced borderline case. *Ernest Muir*

CONTRERAS RUBIO, F., TARABINI C., J. & TERENCIO DE LAS AGUAS, J. Estudio histológico de nefrosis y amiloidosis en lepra. [**Histological Study of Nephrosis and Amyloidosis in Leprosy**] *Rev. "Fontilles".* Alicante. 1960, Jan.–June, v. 5, No. 1, 1–22, 20 figs. (6 coloured) on 3 pls. [14 refs.]

The question is raised as to whether the nephrotic syndrome so common in leprosy is of infective origin (either purely bacterial or immuno-allergical), of toxic origin or if it is of a mixed infective and toxic nature. Experience gathered at the Fontilles hospital suggests the third possibility. After studying 4 patients from clinical and pathological viewpoints, the authors find that 3 are in different stages of development of renal amyloidosis, while the fourth is probably suffering from toxic nephrosis. Lesions of the kidney tubules are divided into 2 categories. Initially, through the influence of intercurrent inflammations which complicate leprosy, there is anoxia which results in amyloidosis. The second type of lesion comes later when the existing lesions develop into

lipoidal nephrosis. The vascular lesions also consist of amyloid deposits. The authors have also been studying the formation of hyaline casts, and conclude that in addition to their protein composition they also contain phospholipids and neutral mucopolysaccharides and mucoproteins.

It is proposed to continue these histological and histochemical studies of the kidney in leprosy. *Ernest Muir*

SCHNEIDER, J., LANGUILLON, J., CLARY, J., PICART, P. & BOISSAN, R. H. Traitement de la lèpre par un sulfamide retard: la sulfaméthopyrazine. [**Treatment of Leprosy with a Delayed-Absorption Sulphonamide: Sulphamethopyrazine**] *Méd. Trop.* Marseilles. 1960, Sept.–Oct., v. 20, No. 5, 543–64, 46 figs.

In testing sulphamethopyrazine [sulphamethoxypyridazine; Sultirène] for its therapeutic effects in leprosy, it was given orally in tablet form to 29 patients with the tuberculoid type, 21 with the lepromatous, and 8 with the indeterminate type, the dose being 0·75 gm. every second day. It was also given by intramuscular injection in a 25% aqueous suspension to 5 lepromatous, 4 tuberculoid and 1 indeterminate type patients, 2·50 gm. being injected once a week or in some cases 5 gm. twice a month. A 23% suspension of acetyl-sulphamethopyrazine was also injected in 30 other patients, divided into 3 groups of 10 each, treatment of each group being begun when the results of the preceding group had been found satisfactory: the dose was at first 2 gm. weekly, but was later raised to 4 gm. twice a month.

After 2½ years' trial of sulphamethopyrazine the results are as follows. The drug is very well tolerated. Given by mouth it does not cause gastric disturbance, nor are there any signs of toxicity. The intramuscular injections are not more painful than those with sulphones. In all the three clinical forms of the disease in which it was tried it has shown therapeutic activity; but improvement was most remarkable in the tuberculoid type. Indeed in this form the results were better than with the sulphones or with any other form of treatment that the authors had used. For mass treatment the intramuscular injections of acetyl-sulphamethopyrazine are the best. [No controls appear to have been used in these trials.]

Further experiments are being tried to find out the efficacy of monthly injections of 7·50 gm. of this drug.

The article is well illustrated with "before and after" photographs.

Ernest Muir

LANGUILLON, J., CLARY, J. & PICART, P. Étude de la sulfamidémie obtenue après administration espacée de sulfaméthopyrazine dans le but de préciser la posologie optimum dans le traitement de la lèpre. [**A Study of Blood Levels obtained after Spaced Administration of Sulphamethopyrazine with the Object of Fixing the Optimum Dosage in the Treatment of Leprosy**] *Méd. Trop.* Marseilles. 1960, Sept.–Oct., v. 20. No. 5, 565–88, 11 figs.

Two suspensions of sulphamethopyrazine [sulphamethoxypyridazine; Sultirène] are under consideration: a 25% suspension of simple Sultirène (7522

RP), and a 23% suspension of acetylated Sultirène (9760 RP). The protocol of the experiment was to find out the duration of sulphonamide blood levels, and to study the course of these blood levels after weekly, fortnightly, 3-weekly and monthly injections necessary to maintain between 20 and 25 mgm. per litre.

The results are compiled in 13 tables and 11 graphs. They indicate that for weekly treatment 10 ml. of suspension 7522 RP or 10 ml. of 9760 RP should be injected. If treatment is given twice a month then 20 ml. or 25 ml. of suspension 9760 should be given as one injection. Further trials are under way to work out the amounts to be used when treatment is given only once a month.

Ernest Muir

TERENCIO DE LAS AGUAS, J. Tratamiento de las leprorreacciones con el Dimetilisopropilazuleno. [**Treatment of Lepra Reactions with Dimethyl-*iso*propylazulene**] *Rev. "Fontilles"*. Alicante. 1960, Jan.–June, v. 5, No. 1, 37–48, 14 charts.

This substance, produced in the laboratories of Beris of Zurich, is known by the abbreviation of Azulene or AZ8. The author treated 10 patients suffering from reacting lepromatous leprosy with AZ8. The dose is 100 mgm. injected parenterally with 40 to 80 mgm. by mouth; if given by mouth alone the dose is 150 mgm. In 8 of the 10 patients treated there was total remission of the reaction. In 2 of the 10 patients Cromoxin was given as well as AZ8, and in these the improvement was more rapid. In all the 10 patients tolerance was satisfactory.

Ernest Muir

TERENCIO DE LAS AGUAS, J. & TORRENT GUASP, F. La monosemicarbazona del adenocromo en el tratamiento de las leprorreacciones. [**Monosemicarbazone of Adenochrome in the Treatment of Lepra Reactions**] *Rev. "Fontilles"*. Alicante. 1960, Jan.–June, v. 5, No. 1, 23–30, 9 charts.

This substance (Cromoxin) is the monosemicarbazone of n-methyl-2: 3-dihydro-3-hydroxy-5-6 quinone indol (MCA) and is derived from adrenaline by oxidation. It is a brilliant orange in colour, and is generally obtained in a 0·05% solution. With this substance, 7 reacting lepromatous leprosy patients were treated, in a dose of 1 mgm. every 8 hours, or an ampoule of 5 mgm. every 12 hours. [Some of the dosages shown on the clinical charts do not seem to correspond with those stated in the text. The highest dose shown on the charts for any one day is 3 mgm.] There was satisfactory remission of symptoms in 5 of these patients. This substance may be used as a substitute for the more expensive corticosteroids, the latter being retained for more obstinate cases.

Ernest Muir

CONTRERAS, GUILLÉN, TERENCIO & TARABINI. Tratamiento de la lepra con D-cicloserina. [**Treatment of Leprosy with D-cycloserine**] *Rev. "Fontilles"*. Alicante. 1960, Jan.–June, v. 5, No. 1, 49–55.

D-cycloserine (D-4 amino 3 *iso*xyonidone) is an antibiotic extracted from *Streptomyces orchidaceus*. The authors first describe the previous trials that

have been made in the treatment of tuberculosis and leprosy with this antibiotic [see, for example, this *Bulletin*, 1958, v. 55, 53, 1338; 1959, v. 56, 56; 1960, v. 57, 1073]. They then give details of the treatment of their own 12 patients over periods up to 11 months. They find D-cycloserine most useful in the treatment of leprosy, causing rapid improvement or disappearance of lesions of skin and mucous membrane. Bacterial changes are also good though less rapid. With a maximum daily dose of 1 gm. tolerance is very good and there are no reactions or changes in the blood or other systems. They intend to increase the number of patients under this treatment, and particularly to add to the list those with repeated reactions or who are intolerant of sulphones.

Ernest Muir

CONTRERAS, GUILLÉN, TERENCIO & TARABINI. Tratamiento de la lepra con Difenil-tiourea (DTU). [**Treatment of Leprosy with Diphenyl Thiourea (DTU)**] *Rev. "Fontilles"*. Alicante. 1960, Jan.–June, v. 5, No. 1, 31–5.

Details are given of the treatment with Ciba 1906 (which is diphenyl thiourea) of 1 patient with tuberculoid and 10 with lepromatous type leprosy. Reference is made to previous trials with this substance by DAVEY and other workers [this *Bulletin*, 1956, v. 53, 1435]. In all cases there was almost complete absence of erythematous reaction and of toxic signs. There was rapid clinical improvement, and in the lepromatous patients satisfactory diminution of bacilli. In 5 patients bacteriological examination of the nasal mucosa became negative after respectively 6, 7, 11, 24, 27 months' treatment; but in none so far, after 2 months' up to 2 years' treatment, has there been complete disappearance of bacilli. [No mention is made of the appearance of drug resistance after a period of months, as mentioned by other workers.]

Ernest Muir

MARTINS, M. G., Jr. Contribuição para o estudo da abrasão da pele da face em lepromatosos. (1.° da Série.) [**Study of Abrasion of the Face in Lepromatous Leprosy**] *Rev. Brasileira Leprologia*. São Paulo. 1960. Mar., v. 28, No. 1, 33–8, 9 figs. [13 refs.].

After describing the methods of abrasion used by other workers, the author describes his own method and the results in 2 patients, the improvement being illustrated by photographs taken before and after.

The first patient's face was covered with large nodules though she had been under treatment with cycloserine for 4 months. The abrasion was done at 5 sittings at intervals of 10 to 15 days, with infiltration of 2% novocaine with adrenaline as an anaesthetic. It was not found necessary to apply any dressing or antibiotic after each operation.

The second patient had made some previous improvement under sulphone treatment over a period of about 2 years, as is shown by photographs; but the immediate improvement after abrasion at 2 sittings changed the whole physical aspect of the patient within 15 days.

It is explained that a crust forms at the site of abrasion composed of dead tissue, blood, etc., and that this falls off about the 8th day leaving a surface covered with epithelium which quickly renews the layers of skin denuded by the abrasion.

Ernest Muir

CONVIT, J. **The Campaign against Leprosy in Venezuela.** *Internat. J. Leprosy.* Wash. 1960, Apr.–June, v. 28, No. 2, 167–70.

In 1946 a policy of increased hospitalization in leprosaria was started. The first leprosy centre was begun in Trujillo in 1947, and more followed till there were 24 established in the country. The surveys made from these centres showed such a prevalence of the disease that most of the treatment had to be conducted from the rural foci, "relegating hospitalization in leprosaria to a complementary status". Experiments with BCG vaccination led to its use for protection in all leprosy centres, all contacts being vaccinated as well as all persons in the infection area in the 0–15 year age-group. The work was at first under the Leprosy Division of the Ministry of Health, but later became integrated into the Ministry's regional medical centres, but maintained connexion with the Leprosy Division. This form of team work has had material advantages. *Ernest Muir*

SISIRUCA, C. **The Leprosy Field Survey System employed in Venezuela.** *Internat. J. Leprosy.* Wash. 1960, Apr.–June, v. 28, No. 2, 171–8, 3 figs.

The author writes from practical experience of antileprosy work in the rural districts of Venezuela. In addition to possessing training in leprology, the doctor must be familiar with geography, population density, communication systems, cultural factors, etc. The ideal method would be complete house interviews, but this is not possible, and patients are unwilling to wait in dispensaries to take their turn for examination. Much stress is laid on cooperation with local authorities, public health officials, educational centres, spiritual leaders and other persons. A composite field team consists of a leprologist with 3 assistants, of whom one is an inspector and one a nurse. Before the visit of a field party to a village an inspector with a field assistant makes preliminary enquiries, and names and particulars are noted down on separate sheets for each family group. Thereafter a field party can generally examine 300 persons a day applying the Mantoux test at the same time. A field assistant remains in the locality and sees that patients receive treatment in their homes. "The system is easily coordinated with a programme of sanitary education and with certain kinds of immunologic work, e.g., in connection with diphtheria, tetanus, etc." *Ernest Muir*

SHEPARD, C. C. **The Experimental Disease that Follows the Injection of Human Leprosy Bacilli into Foot-Pads of Mice.** *J. Exper. Med.* 1960, Sept. 1, v. 112, No. 3, 445–54, 2 text figs. & 4 figs. on 2 pls.

The experiments described in this paper are a continuation of the author's study of *Mycobacterium leprae* obtained from nasal washings of leprosy patients [this *Bulletin*, 1960, v. 57, 1269].

In the present experiments the bacilli were injected superficially into the hind right foot-pad of mice and at approximately monthly intervals, after sacrifice, the feet of the mice were examined histologically or disintegrated for direct counts of the number of bacilli; in a few instances the bacilli were passaged into other mice.

The histological examination showed that the lesion became infiltrated with macrophages and epithelioid cells and that most of the bacilli were intracellular but with no involvement of the nerves. The time that the lesion took to develop depended on the size of the inoculum; with 10^6 bacilli it took 1 to 2 months and with 10^3 bacilli it took 6 months. The counts of the bacilli showed that they increased until a maximum was reached which was approximately 10^6 bacilli, irrespective of the size of the inoculum. In early lesions the bacilli stained uniformly but they later became beaded.

Lesions developed from all of the 22 nasal washings examined and from 12 of 16 skin biopsies, but from none of 16 nasal washings which contained no acid-fast bacilli. Passage of the bacilli was successful 11 out of 12 times, 1 strain being passaged 3 times and another 4 times. From none of the lesions were acid-fast bacilli grown on Löwenstein-Jensen, Tarshis or agar-oleic acid-albumin media.

The author suggests that this experimental disease is valuable for chemotherapeutic and immunity studies. *S. R. M. Bushby*

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (*schistosomes, other flukes*); CESTODES (*Diphyllobothrium, Taenia, Echinococcus, other cestodes;* NEMATODES (*hookworms, Ascaris, filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

FRAGA DE AZEVEDO, J., COSTA MOURÃO, M. & CASTRO SALAZAR, J. M. Ensaio terapêutico com o antihelmíntico *Alcopar* na ilha do Príncipe. [**A Trial of Alcopar Treatment in the Island of Principe**] *Anais Inst. Med. Trop.* Lisbon. 1959, Jan.–Dec., v. 16, Nos. 1/4, 15–37, 1 fig. English summary (9 lines).

122 persons suffering from various intestinal helminth infections on the island of Principe were treated with Alcopar (bephenium hydroxynaphthoate), 5 gm. of the drug (2·5 gm. bephenium base) being given in 45 ml. water; owing to complaints of the bitter taste, sugar and a slice of lemon were added.

3 schemes of treatment were tried: (a) 1 dose fasting in the early morning; (b) 1 dose at midnight 6 hours after the last meal; (c) 1 dose on 2 successive days in the early morning. The ages of the patients ranged from 1 to over 50, most being in the 20–50 age-group. A number of the children showed considerable anaemia.

The faeces were examined by direct film, Willis concentration, and ova count both before, and 7, 14, and 21 days after the end of treatment. No significant side effects were noticed.

The drug was found to be active on *Ancylostoma* spp., the average reduction in the ova count being about 75% and all schemes seemed to be almost equally

effective. It was also active against *Ascaris*, but not against *Trichuris* or *Strongyloides stercoralis*.

[See also this *Bulletin*, 1960, v. 57, 1277.] *W. K. Dunscombe*

FRAGA DE AZEVEDO, J., COSTA MOURÃO, M. & CASTRO SALAZAR, J. M. Ensaio terapêutico com o antihelmíntico *Ditiazanina* no ilha do Príncipe. [**A Trial of Dithiazanine Treatment on the Island of Principe**] *Anais Inst. Med. Trop.* Lisbon. 1959, Jan.–Dec., v. 16, Nos. 1/4, 39–51, 1 fig. English summary (5 lines).

92 children in primary schools on the island of Principe who were suffering from intestinal helminthiasis diagnosed by direct film, Willis concentration, and ova counts, nearly all of whom were infected with both *Ascaris* and *Trichuris*, were treated with dithiazanine given in 100 mgm. enteric coated pills as follows: 1st day, 10 mgm./kgm. body weight, divided into 3 doses; 2nd to 5th days, 20 mgm./kgm. body weight, also given as 3 separate doses. The maximum daily dose was 600 mgm. which for a 30 kgm. child was equal to 6 pills. No special arrangements as regards diet or enemas were made; vomiting occurred quite frequently.

Faecal examinations were carried out 7, 14, and 21 days after the end of treatment. The results showed that the drug was effective on both *Ascaris* and *Trichuris*; for *Strongyloides stercoralis*, out of the 92 children examined 18 who were originally positive had all become negative. It had very little action on *Ancylostoma* spp. *W. K. Dunscombe*

EVANS, J. G., MONSÓN M., C. M. & AGUILAR, F. J. **Clinical Evaluation of New Formulation of Tablets of Dithiazanine Iodide in Multiple Parasitosis in Guatemala.** *Antibiotic Med.* New York. 1960, July, v. 7, No. 7, 415–21. [10 refs.]

The side effects of dithiazanine iodide are abdominal cramps, dizziness and diarrhoea and the incidence has varied from 9 to 40% of patients. There is no evidence that the drug is absorbed. Ordinary dithiazanine tablets disintegrate in 15–25 minutes; the present paper describes trials in which tablets which took 45–60 minutes to disintegrate were used. The preparations were tablets "with 17 multiple coatings". One variety was coated with polyvinyl pyrrolidone, and two more with methylcellulose. The anthelmintic activity and incidence of side effects of each new preparation were compared with those of ordinary dithiazanine tablets by a double-blind technique. Doses of 10 mgm./lb. body weight were given daily for 5 days to 194 patients at a dispensary and an orphanage in Guatemala City.

The new coatings did not adversely affect anthelmintic activity against *Ascaris*, *Trichuris* and *Necator*. The side effects were also the same in character and incidence, and in the group of patients at the dispensary the new tablets gave rise to some side effects, although the more rapidly disintegrating ordinary tablets did not.

[The authors make a lukewarm attempt to suggest that the methylcellulose coating might have reduced the incidence of vomiting, but they appear to be unconvinced. So is the reader.]

[See also this *Bulletin*, 1960, v. 57, 915.] *L. G. Goodwin*

GÜRALP, N. **Present Situation of Schistosomiasis in Turkey.** [Miscellanea.] *Acta Tropica.* Basle. 1960, v. 17, No. 3, 261–3.

This paper reports the examination for human schistosomiasis of 268 sheep, 181 goats and 75 cattle in south-east Turkey. Faeces and rectal scrapings were collected before slaughtering and examined by concentration and pressure techniques respectively and after slaughter the mesenteric and portal veins were examined macroscopically for adult worms. Neither ova nor worms were found in the animals examined. Investigation of 19 people revealed *Schistosoma haematobium* ova in the urines of 5. Three species of snails found locally were examined for developing forms of schistosomes, with negative results. None of the snails belonged to recognized genera and probably there are others. The author fears that if these are not eliminated the disease may become widespread. *T. H. Davey*

FERREIRA, E. G. & GOMES, J. A. Bilharziose o foco de Malanje (Angola). (Subsídio para o conhecimento das bilharzioses em Angola.) [**A Focus of Schistosomiasis in Malanje, Angola**] *Anais Inst. Med. Trop.* Lisbon. 1959, Jan.–Dec., v. 16, Nos. 1/4, 407–32, 3 maps & 1 chart. English summary.

Beginning in 1956 a mobile unit from the Sleeping Sickness Commission examined persons in the Malanje region of Angola to get an idea of the extent of vesical schistosomiasis. The disease in some form has been known in Angola for over 60 years and there are at least 7 main foci of which the region described (Malanje) is an important one. An extensive description is given of the climatological and topographical features, the latter being specially important in view of the large number of rivers, several lakes and a lowland area where there is extensive rice cultivation.

After a previous report in 1952 of 2 cases being found the authors examined 3,277 specimens of faeces for *Schistosoma mansoni* but all were negative.

As regards vesical schistosomiasis, persons were examined in 4 of the 6 areas into which the region is divided administratively. Out of a census population of 182,000, 27,577 persons had their urine (centrifuged deposit) examined. 11,892 (43%) were found positive, the percentages ranging from 24 to 70. The incidence in children under 15 years of age was as high as in older persons. Many of the positive patients showed no evidence of haematuria. *W. K. Dunscombe*

SHIFF, C. J. **Observations on the Capability of Freshwater Vector Snails to survive Dry Conditions.** *J. Trop. Med. & Hyg.* 1960, Apr., v. 63, No. 4, 89–93. [10 refs.]

The application of molluscicides at the height of the dry season may not kill those snails which have been able to survive desiccation on the banks of the habitat. This paper reports the results of experiments in Southern Rhodesia to determine the ability of intermediate hosts of *Schistosoma* and *Fasciola gigantica* to withstand drying of the habitat. Both *Biomphalaria pfeifferi* and

Bulinus globosus were able to survive on damp mud for periods of up to 50 days provided that they were protected from the direct rays of the sun. *Lymnaea natalensis* was unable to survive more than a few days even at high humidities, but the species was able to lay eggs on damp mud and these could survive for 20 days and the young snails were able to remain alive by crawling into places with a suitable microclimate. *C. A. Wright*

KIRKALDY-WILLIS, W. H. **The Cystoscopic Appearances of the Urinary Bladder in Schistosomiasis.** *East African Med. J.* 1960, Aug., v. 37, No. 8, 540–42, 18 coloured figs. on 3 pls.

Cystoscopy is of much value in the diagnosis and in the assessment of success in the treatment of urinary schistosomiasis. It also helps materially in the detection and correction of complications resultant from the disease. This paper essentially consists of 18 excellent water-colour depictions of changes seen cystoscopically in various stages of *Schistosoma haematobium* infection, together with a clear and brief description of each and a statement of its significance. Those concerned with the clinical investigation and treatment of bladder schistosomiasis should consult this work in the original. *A. R. D. Adams*

KHATTAB, M., FANOUS, V. & ABUL-FADL, M. A. M. **Blood Volume Studies in Bilharzial Hepatosplenomegaly.** *J. Egyptian Med. Ass.* 1960, v. 43, No. 5, 280–92. [22 refs.]

Initially the total blood volume was calculated by using Evans Blue dye; plasma volume was estimated by the concentration of dye in a sample taken exactly 10 minutes after its introduction into the circulation, and the total blood volume was then given by the formula

$$\frac{\text{Plasma volume}}{100-\text{haematocrit}} \times 100$$

Haemolysis, when it occurred, was found to vitiate the result. A technique was then devised to obviate this by precipitating with ammonium sulphate and acetone the plasma proteins, haemoglobin, lipoids and other materials causing turbidity. Rochelle salt (sodium and potassium tartrate) was also added to minimize absorption of the dye by the precipitated proteins and to help complete elution of the dye, so facilitating its quantitative extraction in the clear aqueous acetone supernatant.

Study of 60 healthy male Egyptian adults showed a variability of blood volume of $\pm 11{\cdot}9\%$. A more satisfactory correlation between blood volume and height was found than that between blood volume and body weight; the relationship was a straight line of regression of blood volume on height; so from a mathematical equation the blood volume of any normal male person of a given height could be predicted. This same correlation also proved to be statistically significant for 32 healthy adult Egyptian women. The blood volumes of 38 patients, all with long histories of continuing schistosomal infection, were calculated according to the formula; their actual blood volumes were determined by the authors' modified Evans Blue method. In all these patients the determinations were found to be higher than the predicted figures; the

percentage of deviation ranged from 13 to 74·4%. In those patients with very advanced disease, with big spleens and distension of abdominal veins, the determined blood volume proved to be at least 50% greater than the predicted volume. The increase in blood volume was greater in plasma than in red cell volume, as the haematocrit readings were low. Some of those with the greatest increase showed evidence of pulmonary hypertension though not every case of pulmonary hypertension shows hypervolaemia. There was no significant correlation between blood volume and anaemia, oedema or ascites.

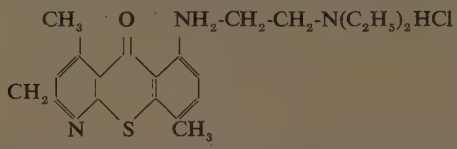
Explanations of the increased blood volume may lie in the distension of the portal bed, in fluid retention as a result of cirrhosis, in failure of the damaged liver to inactivate the posterior pituitary antidiuretic hormone and oestrogens, or in the presence of a vasodepressor substance of hepatic origin which is known to occur in patients with cirrhosis. The increase in plasma volume may be compensatory for a reduction in red cell volume; in these advanced cases of schistosomiasis anaemia probably is less real than apparent, in view of the increased total blood volume; the same applies to the blood proteins. Hypervolaemia may be a factor contributory to the congestion of veins seen in the neck, and almost certainly it must contribute to the pulmonary hypertension encountered in these cases. *A. R. D. Adams*

NAGATY, H. F., RIFAAT, M. A. & EL BOROLOSSY, A. W. **Synergism between Antimony (Tartar Emetic) and Thioxanthone Compounds in the Treatment of Schistosomiasis.** *J. Trop. Med. & Hyg.* 1960, Sept., v. 63, No. 9, 199–203. [18 refs.]

Antimony salts so far have not been surpassed for the treatment of schistosomiasis, but they have to be given parenterally. The xanthone drugs can be given orally but they are less effective; also they cause toxic side effects, often serious, when used in maximum dosage. The authors have given lucanthone HCl (Miracil D or Nilodin) concurrently with tartar emetic, both drugs being given in half their usual dosage, to 21 Egyptian patients with urinary schistosomiasis; they treated various control groups with either drug alone in similar reduced dosage, or in full dosage, for the same or longer periods.

10 patients were given 10 mgm./kgm. of lucanthone HCl alone daily for 12 days; the urines of only 4 of these became free from eggs and remained so for 120 days. 18 patients were given 1 mgm./kgm. of tartar emetic daily for 12 days; 9 of them were urine negative at the 120th day. 21 had the same (half) daily dosage of lucanthone together with the same (half) tartar emetic treatment over 12 days; 20 of these remained urine negative at the 120th day. 10 had the full dosage of 20 mgm./kgm. lucanthone daily for 12 days; 7 of these were urine negative at the 120th day. 5 had the full dosage of 20 mgm./kgm. lucanthone daily over 20 days and 4 of these remained urine negative at the 120th day. It is evident from the 120-day test that the adoption of the half dosage combined treatment gave a 95% (20/21) cure rate as against a 40 to 50% cure rate with either of these drugs given alone in similar (half) dosage; furthermore the unpleasant side effects of both drugs were reduced. Lucanthone HCl and tartar emetic therefore acted synergistically when given concurrently.

A new preparation, Compound 17581 [this *Bulletin*, 1958, v. 55, 1346] (the hydrochloride of 1-beta-diethylamino-ethylamino-4, 6, 8-trimethyl-5-azothioxanthone), has the following structural formula:



This drug was in the first instance given alone at a dosage of 14 mgm./kgm. daily for 5 days (a total of 70 mgm./kgm. body weight); 14 patients were so treated; all continued to pass viable ova in the excreta at the 12th day. 1 mgm./kgm. (half dose) of tartar emetic daily for 5 days was given to 18 patients; only 9 (50%) of these were urine negative on the 12th day. Further series of patients were treated with a half dosage (7 mgm./kgm.) of 17581 with concurrent tartar emetic treatment at a dosage either of 1 or of 2 mgm./kgm. daily for 5 days; the excreta of all 44 of them were free from eggs by the 12th day. The same result was obtained with a daily full dosage (2 mgm./kgm.) of tartar emetic given alone for 5 days. The side effects resultant on treatment with 17581 when given alone in full dosage (14 mgm./kgm. daily) were severe. Patients treated with half this dosage together with a half dosage of tartar emetic suffered less often and less markedly from side effects; the ova vanished more rapidly from their excreta than was the case in those treated with tartar emetic alone either in half or in full dosage. When 17581 in half dosage (7 mgm./kgm.) was given concurrently with a full dosage of tartar emetic (2 mgm./kgm.) the side effects of both drugs were severe.

17581 shows marked synergistic action when given concurrently with tartar emetic and this treatment for schistosomiasis is very satisfactory (100% cure) provided that each drug is kept to half its full dosage. *A. R. D. Adams*

AWWAAD, S., NAGATY, H. F., ELGUINDY, M. & RIFAAT, M. A. **TWSb in treating Urinary Bilharziasis in Egyptian Children.** *J. Trop. Med. & Hyg.* 1960, Sept., v. 63, No. 9, 204–5.

Antimony dimercaptosuccinate, TWSb [see this *Bulletin*, 1955, v. 52, 56], differs from antimony tartrate in that the oxygen atoms of the hydroxyl groups are replaced by sulphur; therefore the antimony is more tightly bound. Its decomposition results in the virtually non-toxic antimonious sulphide instead of toxic antimonious oxide which is formed from tartar emetic.

20 Egyptian children (6–13 years) with *Schistosoma haematobium* infection, after comprehensive clinical and biochemical examinations, were given a total dosage of 0·04 gm./kgm. body weight of this drug in 5 intramuscular injections; these were given daily (5 patients), on alternate days (5 patients) or twice weekly (10 patients). The patients' urines were examined daily during the first week, then twice weekly for a month, and then once weekly for another month. In the patients given daily injections living ova vanished from the urine within 2 weeks of completion of the treatment; in those treated on alternate days, within 10 days after its completion; and in those treated twice weekly, within

a week of its completion. Eggs reappeared in the urine of only one of the patients; he had been treated daily.

Toxic symptoms were slight; vomiting, local pain [presumably at the site of injection] and abdominal pain were those evident in a minority of the patients and they were not severe. There was no cough, rash or drug fever, and X-ray examinations of the lungs showed no changes in them. Biochemical tests revealed no blood, liver or kidney reactions to the drug; but electrocardiograms showed the significant temporary changes expected with such antimony treatment. These side effects were most marked on daily dosage, and after this also the single "relapse" followed. Twice weekly dosage with TWSb is therefore recommended as being safer and more effective than daily dosage.

[See also this *Bulletin*, 1959, v. 56, 1249.] *A. R. D. Adams*

MILLER, J. H. *Papio doguera* **(Dog Face Baboon), a Primate Reservoir Host of** *Schistosoma mansoni* **in East Africa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Jan., v. 54, No. 1, 44–6, 4 figs. on 2 pls.

Primates in Africa have not previously been found naturally infected with *Schistosoma mansoni* though they have been found so in the western hemisphere. This paper reports the results of examination of the tissues of 134 baboons (*Papio doguera*) from south-eastern Kenya. *S. mansoni* ova were found in 32 (23·9%), mainly in the mucosa and submucosa of the descending colon. Infection appeared to become established soon after weaning as estimated by the state of dentition, and to increase steadily in incidence with age in males but not consistently so in females. The prevalence of natural infection in this species of baboon indicates that it is a reservoir host in East Africa, but the output of viable eggs is small. *T. H. Davey*

SMITHERS, S. R. **The Isolation of Viable Schistosome Eggs by a Digestion Technique.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Jan., v. 54, No. 1, 68–70, 2 figs.

The author describes a method for isolating viable eggs of *Schistosoma mansoni* by digestion of the liver and gut of infected hamsters, first with trypsin and then with pepsin. The digest, plus 10 times its volume of 0·9% saline, is then passed through 52-mesh and 85-mesh sieves into conical urine glasses and is allowed to sediment for 20 minutes. The deposit is then washed 3 times in saline by centrifugation. To the deposit thus obtained 10 ml. of saline (*p*H 1·8) and 1 mgm. pepsin in 1 ml. acid saline are added and the eggs are incubated at 37°C. for 2 hours. After 6 washes by centrifugation in saline, the supernatant should contain mostly dead eggs, the viable eggs, in various stages of development, being in the sediment. At least 100,000 eggs have thus been obtained from 5 hamsters, about one-third of them being mature; they contained miracidia which hatched out readily in fresh water and were used to infect snails. Eggs thus obtained can be used for the circumoval precipitin test. Purified eggs from the sediment and dead eggs from the supernatant are shown in 2 photomicrographs. *G. Lapage*

ROWAN, W. B. & GRAM, A. L. **Quantitative Recovery of Helminth Eggs from Relatively Large Samples of Feces and Sewage.** *J. Parasitology.* 1959, Dec., v. 45, No. 6, 615–21, 2 figs.

The authors describe in detail a technique for the recovery of helminth eggs from 20-litre samples of domestic sewage, which, although it requires the special apparatus described and takes time, is, they claim, an efficient quantitative means of recovering the eggs. It was designed especially for the recovery of the eggs of *Schistosoma mansoni*. For the details the paper itself must be consulted. Briefly it may be said that samples of formolized sewage are sedimented and suspended materials are removed by the apparatus described, so that a 2% solution of NaCl containing the eggs is obtained. Aliquots of this are then passed through filter papers which are dried over ninhydrin reagent, which stains some of the eggs (*e.g.* those of *S. mansoni*) blue. The damp filter paper is then placed, together with 2% agar, between two glass plates and is examined with a dissecting microscope.

Table I gives the results of recovery of eggs of *Ascaris, Trichuris* and *Schistosoma* from 17-litre samples from a sewage works at San Juan, Puerto Rico. With these relatively large samples it was possible to detect eggs present in very low densities.

The method was also used to recover eggs from 10 gm. samples of the faeces of a patient having treatment with Fuadin. Just before treatment 455 eggs per dry gm. of faeces were found; 7 days later, after 9·5 ml. Fuadin, 86·7 eggs per dry gm. were recovered; and after 8 more days (after a total of 19·5 ml. Fuadin) 119·5 eggs per gm. were found. The complete treatment lasted 41 days, the patient receiving a total of 59·5 ml. Fuadin, and 30 days after treatment ceased no eggs were found in the faeces.

A method is also described for the separation of viable eggs of *S. mansoni* from the tissues of infected mice by employing the channelled settling tray used for the recovery of eggs from sewage. *G. Lapage*

PINOTTI, M., REY, L., ARAGÃO, M. B. & CUNHA, A. G. Epidemiologia da esquistossomose e variação periódica das populações malacológicas, em Pernambuco, Brasil. [**Epidemiology of Schistosomiasis and Periodic Variation of Malacological Populations in Pernambuco, Brazil**] *Rev. Inst. Med. Trop. São Paulo.* 1960, May–June, v. 2, No. 3, 183–8, 2 figs. (1 coloured). English summary.

In a number of cities in the state of Pernambuco observations on the fluctuation of the populations of snail intermediate hosts of *Schistosoma mansoni* have been carried out by teams of trained boys. This paper reports the results of this type of survey in the town of Vitória de Santo Antão where the snail concerned is reported to be *Australorbis stramineus* (=*Tropicorbis centimetralis*).

The observations reported extended over 5 years and show that the annual peak in the snail population density curve follows the peak of the rainfall curve by several months but that the fluctuation in snail populations in different parts of the river does not coincide. The greatest population was found in the part of the river where it flows through the centre of the town; the density

in this sector reached its peak at the same time as the sector below the town but about a month before the part upstream. *C. A. Wright*

CHERNIN, E. & SCHORK, Ann R. **Effects of Streptomycin on the hatching of *Australorbis glabratus* Eggs.** *Exper. Parasit.* New York. 1960, Feb., v. 9, No. 1, 9–13.

Earlier work by Chernin and other workers has shown that streptomycin has an inhibitory effect on the growth and fecundity of freshwater snails [this *Bulletin*, 1958, v. 55, 666]. The present paper deals with the effect of this antibiotic and penicillin in various salt solutions on the hatching of snail eggs. The results indicate that penicillin has no effect on the hatching of the eggs of *Australorbis glabratus* while streptomycin can inhibit hatching. This effect of streptomycin is blocked by the presence of calcium ions but not manganese. *C. A. Wright*

MALDONADO, J. F. **The Daily Emergence of the Cercaria of *Schistosoma mansoni*.** *Bol. Asoc. Med. de Puerto Rico.* 1959, Sept., v. 51, No. 9, 336–9.

The author studied, by the technique described [ROWAN, this *Bulletin*, 1959, v. 56, 176], the daily emergence of cercariae of *S. mansoni* from *Australorbis glabratus* exposed to several miracidia in a concrete pond from which samples of the water were taken. A table shows the results of 57 trials done with 1,560 snails during 18 months and records the average conditions of temperature, *p*H, light and water flow prevailing. The number of cercariae emerging increased until 6 p.m. and then began to decrease, but the number emerging scarcely varied between bright days and cloudy, darker days. Each snail shed about 500 cercariae a day and the cercariae lived 10 hours, though the warmer the water was, the shorter time they lived. Other workers quoted have found that the cercariae lived for 24 to 30 hours and have observed daily emergence of 100 to 7,500 cercariae from 4 snails exposed to only 1 miracidium each [*ibid.*, 1935, v. 32, 245], or 1,300 from each of 5 snails. The author's study emphasizes the part played by light and corroborates earlier literature in this respect. The part played by light is being further studied. *G. Lapage*

PELLEGRINO, J. & RODRIGUES, B. A. **The Influence of Seitz Filtration on the Activity of *Schistosoma mansoni* (Adult Worm) Antigen.** [Research Notes.] *J. Parasitology.* 1960, Oct., v. 46, No. 5, 647.

Although Seitz filtration is commonly recommended for schistosome antigens used in intradermal tests, its influence on the tests does not seem to have been studied.

The authors, from Belo Horizonte, Brazil, prepared an extract of *Schistosoma mansoni*, 1 in 1,000 by weight in Coca-merthiolate solution and filtered some of it through EKS sterilizing Seitz sheet. It was found that total nitrogen decreased thereby from 0·048 mgm./ml. to 0·004 mgm./ml. and most of the filtrate nitrogen was non-protein N.

0·05 ml. samples of filtered and non-filtered antigens were injected intradermally in 21 patients with active *S. mansoni* infection. After 15 minutes, the outline of the weals was drawn in ink and their areas determined [this *Bulletin*, 1957, v. 54, 1429]. For the non-filtered extract the mean area was $2{\cdot}19 \pm 0{\cdot}49$ sq. cm. and for the filtered extract $0{\cdot}86 \pm 0{\cdot}27$ sq. cm.

If an area of 1·2 sq. cm. is taken as a minimum for a positive test [*ibid.*, 1959, v. 56, 547], the skin test was positive in all patients with the non-filtered extract and in only 1 after the same extract had been filtered. Evidently much of the antigenic material had been retained in the EKS sterilizing sheet.

When a better sterilizing effect is required (in addition to such preservatives as 0·4% phenol or 1/5000 merthiolate), the extracts may be heated to 56°C. for 1 hour on 3 consecutive days [*ibid.*, 1951, v. 48, 1015]. This does not change the skin test activity significantly. *H. J. O'D. Burke-Gaffney*

De Alvarenga, R. J. & Pinto, E. P. Pólipos esquistossomóticos do reto. [**Schistosomal Polyps of the Rectum**] *Rev. Assoc. Méd. Minas Gerais.* 1960, Mar., v. 11, No. 1, 8–12, 6 figs. [11 refs.] English summary.

The authors' paper is based on a study of 40 patients suffering from rectal polyps due to *Schistosoma mansoni*; they state that an examination of the records in the out-patient department of the division of Proctology at the Santa Casa at Belo Horizonte showed that 22 out of 2,000 out-patients were found suffering from schistosomal rectal polyps. 15 of these had *S. mansoni* ova in the faeces, 21 had either adult worms or ova on histological examination, while in 4 others in whom rectal biopsy or faeces were found to be positive the polyps were probably adenomatous since there was no histological evidence of a schistosomal cause.

Polyps due to *S. mansoni* are only rarely located above the rectum, and are in the great majority of cases multiple. The ages most affected are 1–30 years which contrasts with ordinary polyps where the age incidence is between 40 and 60 years. Histologically, obstruction of the small veins gives rise to haemorrhage, the granulation tissue round the worms or ova forms from within outwards, the epithelium remains intact except on the most superficial areas where it may be exposed to trauma. A pair of worms was found constantly at the base of the polyp.

Clinically the most frequent symptoms were loss of blood, pain, tenesmus, and prolapse. Treatment is surgical, either by excision or coagulation. In none of the polyps was there any suggestion of a pre-cancerous adenomatous hyperplasia. *W. K. Dunscombe*

Chernin, E., Michelson, E. H. & Augustine, D. L. *Daubaylia potomaca*, **a Nematode Parasite of** *Helisoma trivolvis*, **transmissible to** *Australorbis glabratus*. *J. Parasitology.* 1960, Oct., v. 46, No. 5, 599–607, 13 figs. on 2 pls.

"*Daubaylia potomaca* Chitwood and Chitwood, 1934, originally described as a parasite of *Helisoma trivolvis* in the Potomac River, is now reported as a natural infection in *H. trivolvis* and *H. campanulatum* from a stream in the

vicinity of the University of Michigan Biological Station, Cheboygan, Michigan. Transmission of *D. potomaca* from *H. trivolvis* to *Australorbis glabratus* was accomplished in the laboratory, and observations indicate that the life cycle may be completed in 15 days or less. Eggs, larvae and adult nematodes of both sexes were found simultaneously in deep tissues. The known geographic distribution of the parasite and the pathology produced by it are described, and its possible use as a means of biological control for *A. glabratus* is noted."

Olivier, L. & Haskins, W. T. **The Effects of Low Concentrations of Sodium Pentachlorophenate on the Fecundity and Egg Viability of** *Australorbis glabratus*. *Amer. J. Trop. Med. & Hyg.* 1960, Mar., v. 9, No. 2, 199–205, 1 fig. [22 refs.]

The use of low concentrations of molluscicides as chemical barriers in irrigation systems has recently been tried. This paper gives an account of the effects of constant exposure of snails to low concentrations of sodium pentachlorophenate in the laboratory. In solutions of 0·05 and 0·1 p.p.m. there was a marked reduction in egg laying by adult *Australorbis glabratus* and a high proportion of the eggs which were laid were non-viable. Egg-laying capacity of the snails and viability of the eggs improved when the chemical was removed.

It is suggested that the use of low concentrations of this molluscicide at the peak breeding season of the snails or as a follow-up after treatment at higher doses might be a more effective and more economical method of snail control than repeated use of higher concentrations for short periods. *C. A. Wright*

Meyling, A. H., Meyling, J., Schutte, C. H. J. & Pitchford, R. J. **Some Observations on the Effectiveness and Stability of Sodium Pentachlorophenate when used as a Molluscicide.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Nov., v. 53, No. 6, 475–81, 1 diagram.

Opinions in Africa and South America as to the efficacy of sodium pentachlorophenate (PCP) vary greatly, probably as a result of combinations of local conditions [this *Bulletin*, 1958, v. 55, 1245]. This paper reports the results of investigations carried out in the field and in the laboratory in the Eastern Transvaal Lowveld. In running water exposed to the sun PCP, added by continuous drip to give a concentration of 10 parts per million (p.p.m.), yielded a concentration of under 1 p.p.m. ¾-mile downstream, and 24 hours after cessation of the drip no PCP was detected at this point. In a concrete reservoir in sunny conditions PCP at 5 p.p.m. showed a reduction to 1 p.p.m. in 25 hours and had disappeared in 110 hours, while in cloudy weather the concentration dropped more slowly and was detectable (0·8 p.p.m.) up to 115 hours. In a shaded canal an added concentration of 5 p.p.m. dropped to 4·3 p.p.m. at a point 2 miles below, representing 6 hours' flow, but in the exposed dam into which it emptied, the concentration dropped after PCP was stopped, to 3 p.p.m. in 5 hours, 2·4 p.p.m. at 24 hours, 1·1 at 48 hours, 0·9 at 72 hours, and 0·4 p.p.m. at 5 days.

Laboratory experiments showed that the concentration was not significantly affected by the presence of concrete or suspended solids but direct sunlight

caused a reduction from 5 p.p.m. to 0·5–0·7 in 2½ hours The molluscicide proved more effective in soft water; in hard water PCP was more rapidly and completely broken down and was less lethal to snails. It was concluded that light was the most important factor reducing the efficiency of PCP and this was augmented in alkaline water. There would be little scope for the use of PCP in the Transvaal. *T. H. Davey*

ROWAN, W. B. & GRAM, A. L. **Relation of Water Velocity to** *Schistosoma mansoni* **Infection in Mice.** *Amer. J. Trop. Med. & Hyg.* 1959, Nov., v. 8, No. 6, 630–34, 1 fig.

Experiments in the laboratory and in the field in Puerto Rico have shown that mice exposed to flowing water containing cercariae of *Schistosoma mansoni* became infected with the adult flukes. If the density of cercariae in the water was maintained at a constant level the percentage recovery of adult worms from the mice increased with increase in the water velocity.

C. A. Wright

MEISENHELDER, J. E., OLSZEWSKI, Bronislawa & THOMPSON, P. E. **Observations on Therapeutic and Prophylactic Effects by Homologous Immune Blood against** *Schistosoma mansoni* **in Rhesus Monkeys.** *J. Parasitology.* 1960, Oct., v. 46, No. 5, 645–7.

A monkey was infected with 1,000 cercariae of *Schistosoma mansoni.* Egg production reached a peak 2½ months later, and 15 months later it had declined to a low level. When the monkey was killed 32 months after exposure, one pair of living worms could be found. The serum at 30 months yielded good circumoval precipitins and pericercarial membrane reactions.

Blood was taken from this monkey at intervals and was injected intravenously into 2 other monkeys every 2–3 days for 10 days. One monkey received 62 ml. blood 42–51 days after exposure as it was beginning to excrete eggs. Another monkey received 113 ml. during the 10 days after exposure to cercariae. In neither case was any effect on egg production observed, in comparison with similar untreated control monkeys.

It is concluded that transfusions of immune blood equal to one-third of the blood volume of the recipients, failed to affect mature or immature worms.

[See also this *Bulletin*, 1953, v. 50, 533.] *F. Hawking*

ARRU, E. & PARRICIATU, A. Siero di bovini con schistosomiasi all'esame elettroforetico. [**Electrophoretic Examination of Sera of Cattle Infected with** *Schistosoma bovis*] *Parassitologia.* Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 7–11, 2 graphs on pl.

The English summary appended to the paper is as follows:—

"The electrophoretic examination of sera obtained from cattle infected with *Schistosoma bovis* showed a reduction of albumin, and β globulin and an increase of α and γ globulins.

"The authors believe that these modifications are dependent on the same factors which produce the pericercarial and agglutinating activity of sera in schistosomiasis infected cattle."

DEIANA, S. & PARRICIATU, A. Fattori serici anticercariali in soggetti con dermatite da cercarie di *Schistosoma bovis*. [**Anticercarial Substances in the Sera of Subjects with Dermatitis due to** *S. bovis*] *Parassitologia*. Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 149–52, 2 coloured figs. on pl. [11 refs.]

The English summary appended to the paper is as follows:—

"The authors have observed that normal human sera and sera of individuals suffering from cercarial dermatitis (*Schistosoma bovis*) possess cercaricidal activity."

SINHA, P. K. & SRIVASTAVA, H. D. **Studies on** *Schistosoma incognitum* **Chandler, 1926. II. On the Life History of the Blood Fluke.** *J. Parasitology*. 1960, Oct., v. 46, No. 5, 629–41, 18 figs. on 2 pls. [13 refs.]

[See this *Bulletin*, 1956, v. 53, (1020).]

HSÜ, H. F. & HSÜ, S. Y. L. **Susceptibility of Albino Mice to Different Geographic Strains of** *Schistosoma japonicum*. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Sept., v. 54, No. 5, 466–8.

The authors [this *Bulletin*, 1956, v. 53, 1360; 1957, v. 54, 314] found that the Formosan strain of *Schistosoma japonicum* cannot mature in man and usually does not develop well in *Macacus cyclopis*, although the Chinese, Japanese and Philippine strains do; but albino mice are very susceptible to all these four geographical strains. In the present paper the authors record results of their investigation of whether albino mice show different degrees of susceptibility to these four strains.

Cercariae were obtained from *Oncomelania hupensis* (Chinese strain), *O. formosana* (Formosan strain), *O. nosophora* (Japanese strain) and *O. quadrasi* (Philippine strain) and each mouse was exposed to infection with one male and one female cercaria of each strain. The mice were killed 66 days after infection and the presence of eggs in the liver was taken as proof that one adult male worm and one adult female had developed. Table I shows that eggs were found in the livers of 53·21% of mice exposed to the Japanese strain, in 61·02% of those exposed to the Philippine strain, but in only 31·58% of those exposed to the Chinese strain and in 32·56% of those exposed to the Formosan strain.

To study the proportion of the number of adult worms recovered to the number of cercariae used, each mouse was exposed to 50 male and 50 female cercariae of each strain. Table II shows that the average percentage of adult worms recovered was 85·81 (Japanese strain), 82·65 (Philippine strain), 66·7 (Formosan strain) and 43·25 (Chinese strain). The total numbers of worms recovered show that exposure to 50 male and 50 female cercariae produced

approximately equal numbers of male and female adult worms of each strain.

Thus both the rate of infection and the proportion of the number of adult worms recovered to the number of cercariae used were significantly higher with the Japanese and Philippine strains than with the other two strains. It is suggested that, although Hsü and Hsü [*loc cit.*] found that man is not susceptible to the Formosan strain, he may be, like the mice, susceptible in different degrees to the other three geographical strains and that, if he is, this may explain reports of different degrees of damage caused in different geographical areas.

[See also this *Bulletin*, 1960, v. 57, 920.] *G. Lapage*

HSÜ, H. F. & HSÜ, S. Y. L. **Distribution of Eggs of Different Geographic Strains of *Schistosoma japonicum* in the Viscera of Infected Hamsters and Mice.** *Amer. J. Trop. Med. & Hyg.* 1960, May, v. 9, No. 3, 240–7. [11 refs.]

"Distributions of eggs of the four main geographic strains of *Schistosoma japonicum* in the viscera of infected hamsters and mice were studied. The results of the study show that the percentage distributions of eggs of this parasite in the visceral organs of its host were influenced by the strain of the parasite, the species of the host, and the intensity of infection in the host. It may be stated that in general, with the C and F strains, the percentage distributions of eggs in the visceral organs of hosts were higher in the liver than in the small intestine; with the J and P strains, higher in the small intestine than in the liver except in mice infected with one male and one female cercaria of the P strain, where the mean of the percentages of eggs in the liver was higher. As to the species of host, the mean percentage of eggs in the small intestine was lower in the hamster than that in the mouse, and vice versa in the large intestine. When the intensity of infection in the host was at the lowest level, the percentages of eggs were mostly higher in the liver and large intestine, and lower in the small intestine, than in the corresponding organs of the host with the high intensity of infection."

[See also this *Bulletin*, 1960, v. 57, 920.]

HARINASUTA, C. & VAJRASTHIRA, S. **Opisthorchiasis in Thailand.** *Ann. Trop. Med. & Parasit.* 1960, Apr., v. 54, No. 1, 100–105, 2 maps & 1 fig. on pl. [17 refs.]

During the last 8 years between 5 and 10 cases of opisthorchiasis each year have been admitted to the University Hospital at Bangkok, all from the north east region of Thailand. Many of the patients were moribund on admission and died soon afterwards and, at autopsy, numerous *Opisthorchis viverrini* were found in the liver, sometimes in association with hepatic cirrhosis or carcinoma. In cases of mild infection (those with fewer than 1,000 ova per ml. of formed stool) there were usually few or no symptoms. In those of moderate infection (between 1,000 and 30,000 ova per ml. of formed stool) diarrhoea, dyspeptic flatulence, pain over the liver, jaundice in a moderate degree, and fever were frequent. An enlarged liver was found in most cases. The blood showed no anaemia; there was some increase in eosinophils (not more than 20%).

From figures available it was calculated that there are about two million infected persons in the north east of Thailand. There was no significant difference in the infection rate between the sexes. The infection was noted in every hospital; the incidence increased with age to a maximum at between 15 and 40 years.

The inhabitants of the endemic area are addicted to eating raw-fish food. The most popular is "koi-pla" [this *Bulletin*, 1956, v. 53, 620], consisting of raw fish mixed with garlic, lemon juice, fish sauce, pepper, roasted rice and vegetables. On examining fish from lakes and streams the authors found cysts that by feeding experiments were shown to be metacercariae of *O. viverrini*. The cysts were oval and measured 204 × 145 μ; they had two thin walls and surrounding fibrous capsule. When fresh the contained larva showed vigorous movement. After digestion with pepsin followed by trypsin, the metacercariae escaped from the cyst and measured 585 × 150 μ. The cuticle bore delicate spines.

5 cyprinoid fishes were found to harbour the cysts. 90–100% of metacercarial cysts were located in the muscles at the base of the pectoral fins. Of 1,907 fish examined in 6 provinces 36% were infected with an average of 9 cysts per fish.

Surveys of snails were carried out. In the genus *Bithynia* only were cercariae found which morphologically resembled those of *Opisthorchis*.

There appears to be some relation between liver-fluke infection and the appearance of cirrhosis and carcinoma.

Many drugs have been tried, without success, in attempts to eradicate this infection. Some success has been obtained with chloroquine [*loc. cit.*; *ibid.*, 1956, v. 53, 76; 1957, v. 54, 1433], but mass treatment is not recommended at present. The measure most likely to be effective in the control of the infection is to prevent the consumption of raw fish. The construction and use of sanitary latrines in the villages is the second measure of major importance.

It is obvious that when it has been sufficiently established that the intermediary host-snail is *Bithynia* it should be possible to control the infection by destroying them. *Philip Manson-Bahr*

FRAGA DE AZEVEDO, J. & CARVÃO GOMES, F. A aplicação de algumas provas serológicas e cutâneas no diagnóstico de certas helmintíases. [**Intradermal and Serological Tests in the Diagnosis of Certain Helminthiases**] *Anais Inst. Med. Trop.* Lisbon. 1959, Jan.–Dec., v. 16, Nos. 1/4, 5–13. [17 refs.] English summary (6 lines).

The authors of this paper, the senior of whom is the Director of the Institute of Tropical Medicine at Lisbon, prepared saline antigens from *Fasciola hepatica* and *Schistosoma bovis* for both intradermal (ID) and complement-fixation (CF) tests. For the CFT the antigens were finally diluted 1 in 150 for *F. hepatica*, and 1 in 200 for *S. bovis*; for the ID tests the dilution was 1 in 10,000, 0·1 ml. being injected and the test read 15 minutes later.

In the ID tests with *F. hepatica*, 74 of 80 persons not infected were negative and 6 doubtful. In 20 of these the test repeated 1 week later was negative. 6 patients with an *F. hepatica* infection were all positive. No person with a

schistosomal infection was available, but in 60 non-infected persons some of whom had other intestinal helminths 58 were negative to *S. bovis* and 2 doubtful.

In the CFT, 5 of 6 patients infected with *F. hepatica* were positive, 1 serum was anticomplementary; in 1 patient the test repeated 14 months later was still strongly positive. Out of 350 healthy persons tested 17 were doubtful or weakly positive, 27 anticomplementary. In 220 healthy persons 212 had negative sera to *S. bovis*, 3 doubtful and 5 anticomplementary; a control from a known infected person was positive.

The authors conclude that the ID tests were very sensitive while the CF tests were both sensitive and specific. *W. K. Dunscombe*

HSIEH, Hsieh-Chen. **Fasciolopsiasis in Taiwan.** *J. Formosan Med. Ass.* 1959, Oct. 28, v. 58, No. 10, 623–9, 1 map & 7 figs. on 2 pls.

It was thought that infection with *Fasciolopsis buski* was rare in Taiwan until Hsieh discovered, in 1958, the highest endemic area of it at Liu-Ying, where people eat water caltrop. In the present paper the author refers to the literature on this infection in Taiwan since its discovery in 1924. Between 1947 and 1958 no human infections were recorded.

He here records the results of his further study of the incidence of *F. buski* in children at a primary school at Liu-Ying. This was based on faecal examinations by the antiformin-ether technique of 152 male and 128 female children and on dissections of *Segmentina hemisphaerula* collected from ponds in which water caltrop and water bamboo were planted. Eggs of *F. buski* were found in the stools of 28·21% of the 280 children examined, the infection ranging from 44·62% in Kuang-Fu village to 5·88% in Tai-Kang village. Among the children as a whole the incidence was higher (32·24%) in males than in females (23·44%). Cercariae were found in 15 out of 68 (22·06%) of snails examined.

Photographs of the adult worm, the snails, water caltrop and the children are given and also a map of the distribution of *F. buski* in Taiwan. *G. Lapage*

ROMANOV, I. V. [**A Diphyllobothriasis Focus at the Site of the Gorky Water Reservoir**] *Med. Parasit. & Parasitic Dis.* Moscow. 1960, v. 29, No. 5, 611–14. [In Russian.] English summary (9 lines).

ABDOU, A. E. H. **Cysticercosis—a Public Health Problem in Egypt.** *J. Egyptian Pub. Health Ass.* 1959, v. 34, No. 6, 205–15, 2 figs. [16 refs.]

Infections with *Cysticercus bovis* and *C. cellulosae* are common daily findings in slaughterhouses in Egypt. Precise figures of human infection are lacking, but the incidence of tapeworms according to the records of Public Health laboratories throughout Egypt shows a rate per 1,000 of the population of 4·2, 4·06, 3·7, 3·4 and 2·9 in 1951 to 1955 respectively. The incidence in the Hospital of the Faculty of Medicine in Alexandria in those examined is 2·7,

2·8, 4·4, 5·5, 6·8 per 1,000 [shown erroneously as rate percentage over 100 and with an additional arithmetic error in 1941] for 1941, 1943, 1945, 1948 and 1949. All infections were due to *Taenia saginata.*

Tapeworm infection is common among villages where sanitary facilities are primitive. The contents of closets are usually emptied on the fields which are used for growing pasture. Religious practice requires cleansing after defaecation and to eliminate the need for a receptacle for carrying water the field workers use the convenient bank of the irrigation canal, and it is here that cattle tend to graze as the vegetation is lush and the water is nearby. No detailed information as to local incidence of infection in livestock is available, but it seems that it occurs in widely scattered parts of the country. For economic reasons abattoir inspection is restricted to the major cities and large towns. In Cairo abattoir cattle infection between 1955 and 1957 varied between 2 and 4% and pig infection between 0·4 and 1%. In the Alexandria abattoir the corresponding figures varied between 0·2 and 0·6% and 1·8 and 2·4%.

Though *C. cellulosae* is common, human cysticercosis is apparently rare. In the pig the tongue is usually involved and the cysticerci can be felt at the edges as firm nodules. These may be removed or pricked by those concerned in the trade, and longitudinal areas of scarring of the tongue should arouse suspicion in meat inspection. *W. E. Kershaw*

LLOYD, E. L. **Pituitary (Posterior Lobe) for Tardy Tapeworms.** *Practitioner.* 1960, Sept., v. 185, No. 1107, 329.

The author, from the Tropical Diseases Unit, Eastern General Hospital, Edinburgh, describes the use of pituitrin (0·5 ml. intramuscularly) to expel tapeworms whose hold has been loosened by mepacrine. This has been introduced because salts given after mepacrine cause vomiting and the worm may not be passed for a full day afterwards. The aim in the Unit is to have the patient in hospital for a night to "capture the scolex by 09.00 hours" and to discharge the patient after lunch. One case is described in detail and two others are mentioned briefly.

The first patient had a suppository and various laxatives in the evening with little success. At 6 a.m. next morning he received mepacrine 100 mgm. × 10 and was encouraged by side-to-side movement to "assist drainage by gravity"; at about 7 a.m. he was given 0·5 ml. pituitrin and the worm began to pass 7 minutes later. Some 10 minutes later the patient had a cup of tea and within 5 minutes 8 feet of yellow-stained worm, with scolex, were passed. The patient had breakfast at 8 a.m. and returned to duty that afternoon. He had no nausea and no gripes after pituitrin.

The use of pituitrin had been inspired by the case of another patient who had been treated without success for 18 months. She received mepacrine at 5 a.m. and pituitrin at 6.50; at 7 a.m. 2 yards of worm with scolex were passed.

The third patient took mepacrine at 5.30 a.m. and pituitrin at 7 a.m. and passed 2 yards of worm with scolex at 7.30 a.m.

This treatment with intramuscular pituitrin is recommended to avoid the vomiting after salts and the delay in expulsion of the tapeworm.

H. J. O'D. Burke-Gaffney

SEN, A. B. & HAWKING, F. **Screening of Cesticidal Compounds on a Tapeworm** *Hymenolepis nana in vitro*. *Brit. J. Pharmacol. & Chemotherapy*. 1960, Sept., v. 15, No. 3, 436–9. [10 refs.]

The authors describe an *in vitro* technique, with possibly wider applications, for testing compounds against intestinal worms. It is described as simple and economical in time and materials. The mouse tapeworm *Hymenolepis nana* was used and infection was obtained in fresh animals by giving mature ova in known numbers and freed from worm tissues directly into the stomach. The animals were killed 20–40 days later and any worms present were recovered by perfusion of the gut with saline. They were washed in Ringer solution and 1 or 2 placed in nutrient broth containing antibiotics which had no effect on the worms, along with the compound under test. The broth was maintained at 37°C. and the condition of the worms was observed under a dissecting microscope for 24 hours. Some standard anthelmintics were used for comparison purposes in these tests. During *in vivo* tests infected mice were given a dose of drug into the stomach by catheter and were examined on the third day after infection after a 24-hour starvation period. Untreated mice served as controls. Oil of chenopodium, extract of cashew nut, dichlorophen and antimony potassium tartrate were active *in vitro* at a dilution of 1/1 million or less, some others like male fern were less active and killed at a concentration of 1/100,000. The results obtained *in vitro* agreed reasonably well with clinical experience. *J. D. Fulton*

MOROZZI, A. Osservazioni sulla trichinosi delle volpi in provincia di Perugia. [**Trichiniasis in Foxes in the Province of Perugia**] *Parassitologia*. Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 247–51, 1 map.

The English summary appended to the paper is as follows:—

"The epidemiological investigations carried out on trichinellosis in the province of Perugia showed that 19·44% of examined foxes were infected with *Trichinella spiralis*.

"The majority of infected animals (58·33%) were captured in a small district (Vallo di Nera—Norcia—Cascia) where an episode of human Trichinellosis due to ingestion of raw infected pig's meat had been observed and where no trichinous rats were found."

MANDRAS, A. & ADDIS, S. L'impiego della emoagglutinazione nella diagnosi di idatidosi. [**The Haemagglutination Test in the Diagnosis of Hydatid Disease**] *Parassitologia*. Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 217–19.

The English summary appended to the paper is as follows:—

"The authors have studied the significance of the hemoagglutination test—with fresh or formolised red cells following the technique of McKenna or of Ingraham—for the diagnosis of hydatidosis.

"The test, following the original technique of GARABEDIAN and coll. [this *Bulletin*, 1957, v. 54, 1335] showed high sensitivity and specificity. By using formolised red cells, a standardized and simplified test is obtained."

IVANISSEVICH, O. & RIVAS, C. I. Equinococosis hidatídica de las glándulas salivales. [**Hydatid Cyst of the Salivary Glands**] *Semana Méd.* 1960, Sept. 8, v. 117, No. 22, 831–7, 3 figs. [Refs. in footnotes.]

FOY, H. & KONDI, Athena. **Hookworms in the Aetiology of Tropical Iron Deficiency Anaemia. Radio-Isotope Studies.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Sept., v. 54, No. 5, 419–33, 5 figs. [Numerous refs.]

Conflicting views have been expressed on the relation between hookworm infection and tropical iron deficiency anaemia. Most of these views were formed before exact measures of blood and iron loss could be made. The authors selected 15 patients from in and around Mombasa in whom there were a severe iron deficiency anaemia and hookworm infection, uncomplicated by intercurrent infection and malnutrition, and studied them for 6–12 weeks. After full investigation, intestinal blood and iron losses were determined by the use of radio-chromium and radio-iron. 15–20 grains daily of $FeSO_4$ were given, and at a later stage anthelmintics were given, often on several occasions. The results are set out in 2 tables and 5 graphs of individual patients' responses and repay careful study in the original paper. It is sufficient here to state the authors' conclusions about the pathogenesis of hookworm anaemia and its response to treatment, since these explain some of the findings that, both in the past and in the present paper, would otherwise appear contradictory.

There is fundamentally a close relationship between hookworm load and anaemia, but it is often obscured by a host of other circumstances. A patient who has long been infected with worms, and then given a vermifuge, will remain anaemic while harbouring few or no worms; his iron stores are exhausted, and a common tropical diet providing 30–50 mgm. of iron daily, of which 15–25 mgm. might be absorbed, will give him insufficient iron to replace a blood loss of 50 ml. a day; but he will respond fully to oral iron. On the other hand, a patient with a heavy hookworm load not removed by vermifuges, will respond fully to oral iron, regaining normal Hb levels in the blood and restoring the particulate iron previously absent in the bone marrow. The only exception to this occurs when the bone marrow contains giant metamyelocytes (in 25% of patients in this series); in this case the Hb will not rise above about 80% unless folic acid is also given. Hence the present status of the patient is much dependent on previous events. Another important consideration in the depletion of iron stores is that iron loss varies with the Hb level; thus at the onset of an infection, when the Hb is say 14·5 gm./100 ml., the loss of 150 ml. of blood a day will mean the loss of 70–80 mgm. of iron, but this will fall with increasing anaemia. "Maximum iron losses, therefore, occur before the patient is ever seen, and the amount of iron lost after he becomes anaemic is usually a mere fraction of what he lost previously to the development of anaemia."

There are other factors that obscure the relation between worm load and anaemia. The frequency with which worms migrate, and variations in the host's ability rapidly to arrest bleeding from the vacated sites are important; *Ancylostoma duodenale* causes rather more blood loss than *Necator americanus*; an immune response by the host may play some part, though only a minor one; and the anaemia will be less in places where iron intake is unusually

high. Then excessive sweating will add to iron loss, as may other parasites, and increased intestinal "desquamation" may occur when the gut is heavily parasitized. The diet, apart from its iron content, is probably not concerned in the production of hypochromic anaemias.

[Despite their assertion of the close relationship between hookworm load and anaemia, the authors do not attempt to estimate the daily blood loss caused per worm. It is clear that this is because they do not regard it as a constant function, as the previous summary of their views shows. It is also clear that they do not regard this as paradoxical; they give good reasons for regarding the relationship in question as a close one, and refer to other factors as "obscuring" it. This is a fruitful approach, though some might prefer the word "modifying" to "obscuring".] *Alan B. Raper*

KHATTAB, M. & BASMY, K. **Studies on Eosinophilia in Parasitic Diseases and Pellagra.** *J. Egyptian Med. Ass.* 1960, v. 43, No. 5, 394–404. [30 refs.]

Eosinophil counts in normal persons and in persons parasitized with nematodes varied spontaneously by ±40%. Epinephrine caused a drop of over 50% in normal subjects, but not in parasite carriers. Nor was eosinopenia produced in parasite carriers by corticotrophin or cortisone; therefore the effect was not due to adrenal or pituitary insufficiency. It might be due to reticuloendothelial blockade, but the same absence of eosinopenia is present in persons with eczema. However, in pellagrins who showed no significant fall in eosinophils after epinephrine or corticotrophin, cortisone regularly caused eosinopenia; this is taken to indicate in them some degree of suprarenal inactivity.

Alan B. Raper

HURLY, M. G. D. **Chemotherapy of Hookworm Infestation.** *Central African J. of Med.* 1960, Aug., v. 6, No. 8, 348–51.

The author investigated the toxicity of 1-bromo-β-naphthol (1BBN) [MIURA, this *Bulletin*, 1955, v. 52, 465] to patients infected with *Necator americanus* (but in no other serious diseases) in the Gambia, British West Africa. Brief references to the earlier literature are given.

The 12 patients were given a full clinical, parasitological, haematological and urinary examination on admission and malaria and minor diseases were cured before the drug was given. All stools were collected throughout the study. The patients were then given one or more doses in tablets containing 0·25 gm. (250 mgm.) of the drug, given usually at 7.30 a.m. on an empty stomach. The first 6 patients were given a purgative and the stools were searched for worms for two days, the worms found being counted and sexed. Hookworm burdens were estimated before and after each dose by the method of FAUST [see *ibid.*, 1951, v. 48, 840] and eggs were estimated by the Stoll method, the Stoll egg count being multiplied by the weight of the stool. With the number of eggs produced daily by each female worm taken to be 10,000, the number of female worms present was calculated by dividing the total egg output by 10,000. As HURLY [*ibid.*, 1960, v. 57, 56] has shown, this figure is about 30% too high. The estimation can be expressed by the equation given,

which Hurly [*loc. cit.*] found to be accurate to about 30%, though its accuracy is proportional to the number of days over which stools are collected.

Of the 12 patients treated, none was completely cleared of worms, though divided doses totalling 28 gm. a month were given. In 7 patients there was a moderate anthelmintic effect. The toxicity of the drug was low, but it is not recommended for field work because large and repeated doses are required. The results were much less satisfactory than those reported by Japanese workers [Miura, *loc. cit.*] with the same drug, who obtained up to 94% disinfection, but gave the drug to some patients by duodenal intubation; but *Ancylostoma duodenale* prevails in Japan and may be more susceptible to this drug.

The patients improved clinically and the worm burden was reduced, but the number of worms recovered was not related to the size of the dose and was not predictable. The worms were however dead. The drug had no effect on flagellates or on the larvae of *Strongyloides stercoralis*, or on the eggs of *Trichuris trichiura, Enterobius vermicularis* or *Ascaris lumbricoides*.

The results are detailed in a table. *G. Lapage*

NENOW, S. Wpływ promieni słonecznych na jaja *Ascaris lumbricoides* przy różnych wysokościach nad poziomem morza. [**The Effect of Sunlight upon the Eggs of** *Ascaris lumbricoides* **at Different Altitudes**] *Wiadomości Parazytologiczne*. Wrocław. 1960, v. 6, Nos. 2/3, 189–96. English summary.

Fresh and invasive eggs of *Ascaris lumbricoides* were exposed to sunlight at 12–15°C. or 25°C. for periods ranging from 30 minutes to 8 hours and then tested for viability. The exposures were made at various altitudes up to 2,376 metres in the region between 22° 21′ 55″ and 28° 36′ 37″ longitude and 41° 41′ 12″ and 44° 12′ 50″ latitude. The results are presented in detail in tables. The eggs were killed by sunlight after a period ranging from 210 to 480 minutes, fresh eggs being more sensitive than invasive eggs. The lethal effect of sunlight was greater at higher altitudes. *D. J. Bauer*

LEE, Hong-Fang. **Effects of Superinfection on the Behavior of** *Toxocara canis* **Larvae in Mice.** *J. Parasitology*. 1960, Oct., v. 46, No. 5, 583–8. [12 refs.]

"Each mouse in 4 groups was infected with a total of 2,000 *Toxocara canis* larvae given in 3, 4, 5, or 6 spaced inoculations over a period of 6 weeks and sacrificed 8 weeks after the 1st inoculation. In 2 control groups, mice were given respectively 2,000 and 1,000 larvae in single inoculations. The 1st was sacrificed 8 weeks, the second, 2 weeks after inoculation. While all of the test animals survived, 3 in the 1st control group died. Pepsin and trypsin digests were used for the recovery of larvae from the tissues. The order of decreasing numbers of larvae recovered from various locations was the carcass, liver, brain and lungs for the superinfected and 2-weeks control groups, whereas, in the 8-weeks control group the order was the carcass, brain, liver and lungs. In the superinfected mice there was about 20 percent lower recovery of the inoculated larvae than in either of the control groups. Superinfection had no

apparent effect on the extent of encapsulation but did increase the relative number of encapsulated larvae located in the liver."

BURNETT, G. F. **Filariasis Research in Fiji 1957–1959. Part I. Epidemiology.** *J. Trop. Med. & Hyg.* 1960, July, v. 63, No. 7, 153–62. [20 refs.] **Part II. Experiments in Larval Control of Mosquito Vectors.** *Ibid.*, Aug., No. 8, 184–92. **Part III. Experiments in Control of Adult Mosquitoes.** *Ibid.*, Sept., No. 9, 208–15. [15 refs.]

These three papers include observations on the epidemiology of filariasis in Fiji which supplement those of SYMES [this *Bulletin*, 1960, v. 57, 60], and also record the results of experiments in mosquito control.

I. Investigations into the prevalence and feeding habits of *Aedes* (*Stegomyia*) *horrescens* and *Aedes* (*Finlaya*) *freycinetiae* suggested that they were not important as vectors of filariasis; the Fijian strains of non-periodic *Wuchereria bancrofti* did not develop readily in *Aedes* (*Ochlerotatus*) *vigilax*. Dissection results are given for mosquitoes caught in the bush, in gardens and plantations and in and near villages, these last being subdivided by mosquito species and filarial larval stage. Mature larvae were found in *A. fijiensis*, *A. pseudoscutellaris* and *A. polynesiensis*, but not in *Culex pipiens fatigans*; these four species had previously been incriminated as vectors by Symes. It is suggested that the percentage of the different larval stages might be used to estimate a mean daily mortality rate for the four vector species, and that this is about 20% for the three *Aedes*, and 29% for *C. p. fatigans*.

The relative importance of these vectors was assessed by comparing their prevalence in different areas (as judged by adult catches) with infection rates in the human population. *A. pseudoscutellaris* and *A. polynesiensis* are difficult to distinguish from each other in the field, and in combination are considered to be the principal vectors of filariasis in Fiji. *A. fijiensis* is important where it occurs, but its specialized breeding requirements limit its distribution; *C. p. fatigans* may be important as a secondary vector, but seemed incapable by itself of maintaining a high level of infection.

Some details of mosquito biology are given. *A. fijiensis* breeds in the leaf axils of cultivated *Pandanus* trees inland, but not to the same degree near the coast, where it favours a tall wild species. *A. polynesiensis* breeds predominantly in crab-holes, and *A. pseudoscutellaris* was common in cut bamboos. All four vectors were found to persist in considerable numbers throughout an unusually dry period, although the numbers of other pest mosquitoes fluctuated considerably.

Little information is given on infections in the human population. The campaign of perivillage sanitation started in 1944 is judged to have had no significant effect on overall infection rates, although changes have occurred in certain villages. The use of 1 cc. venous blood will reveal more infections than the examination of one or three drops of capillary blood, and the accuracy of diagnosis obtainable by the smaller amounts was estimated "from a sample of 92 people, whose individual counts are given in Table I of my report (Burnett 1960a) [to the Secretary of State for the Colonies]. Of these, eight were missed by the use of three 20 cmm. drops and 14, 14 and 11 (mean 13) by each series of one drop. Thus if we examine one drop we must add 9·5 per cent and if three drops 16·5 per cent to find the number who would be detected by 1 cc."

Microfilariae were found in the blood of mynahs and pigeons, and *Dirofilaria immitis* was common in dogs, but these are not thought to have complicated the mosquito dissection results.

II. Attempts to control *A. pseudoscutellaris* and *A. polynesiensis* by removing or destroying their breeding places were ineffective, partly because of the difficulty in finding all of them, but also because new artificial breeding places were rapidly created by human activity. The same drawbacks hampered efforts to control breeding by the use of larvicides. The larvae of *A. pseudoscutellaris* readily developed resistance to DDT; breeding in piles of coconut shells, however, could be suppressed by spraying with dieldrin wettable powder and by thatching with several layers of leaves. Dieldrin and BHC pellets prevented breeding in tree-holes and in bamboo pots. For holes of the land crab *Cardisoma carnifex*, similar pellets were less effective than was killing the crabs by poison baiting followed by stopping of the holes. The baits recommended are 5·0% BHC or 0·5% aldrin as wettable powder mixed with rice bran; re-invasion of cleared areas by crabs was slow. It was not possible to demonstrate that the various methods used had reduced the number of adult mosquitoes of these two species.

In some areas *A. fijiensis* breeds mainly in the leaf axils of large wild species of *Pandanus* and felling of these around one village reduced the number of adult mosquitoes caught; elsewhere, however, *A. fijiensis* bred extensively in cultivated *Pandanus*.

The breeding of *C. p. fatigans* in pit latrines was controlled by the application of gear oil, and breeding in surface drains by ½% DDT in Shell Malariol HS, or with 2% dieldrin pellets; judged by adult catches, however, the effect on total numbers was negligible.

III. Dieldrin emulsion was used as a residual spray in one village against *A. fijiensis* and in another against *C. p. fatigans*. Daylight catches of resting *A. fijiensis* were much reduced, but the number entering houses was affected only for a few weeks after each treatment. Assessment of the results in the *C. p. fatigans* village was prevented by a hurricane which blew down many of the houses; some reduction in the number of resting mosquitoes was evident, but there is no information on the mortality of mosquitoes entering houses.

This third paper also contains the author's conclusions and a summary of Parts I to III. The control of filariasis in Fiji by measures directed against the vectors is unlikely to succeed; the problems involved are complex, and such measures would have to be applied efficiently on a wide scale for many years. Control by drugs is an attractive alternative, and should give much quicker results at a fairly low and diminishing cost.

[These papers have been condensed from a fuller mimeographed report to the Secretary of State for the Colonies. They contain much interesting information, but their value is lessened by insufficient care in preparation, and by too-frequent reference to the unpublished report; anyone without access to this will be unable to understand some of the conclusions reached. For example, the sentences quoted above from Part I about microfilaria counts are not only contradictory, but the percentages mentioned are apparently not calculated on a total of 92; on p. 187 dieldrin spraying of piles of coconut shells is said to have "completely prevented breeding for five months, the period of observation", although Table VIII on the same page shows that larvae were found in sprayed piles at 4½ and 11 weeks after spraying. A method of calculating

mosquito mortality would be useful, but the validity of the method suggested seems questionable in the absence of fuller information about the duration of the different larval stages of *Wuchereria bancrofti* in the various mosquito hosts.] *T. Wilson*

McMillan, B. **The Importance of *Culex fatigans* as a Vector of *Wuchereria bancrofti* in New Guinea.** *Trop. & Geograph. Med.* Amsterdam. 1960, June, v. 12, No. 2, 183–5.

Culex pipiens fatigans from a colony maintained at the Malaria Control Laboratory, Maprik, Sepik District, Territory of Papua and New Guinea, were fed on two occasions on an indigenous male infected with nocturnally periodic *Wuchereria bancrofti*. At the times of feeding, microfilaria counts per 20 cmm. blood were 105 and 138 respectively.

The mosquitoes were kept at a temperature of 64–76°F. and at 85–89% relative humidity, and dissected at 12½, 14½ and 17½ days after feeding. The results are tabulated; an infection rate of 25·5% was obtained in 47 mosquitoes dissected. [This rate includes all larvae from early stage II onward. Only the mosquitoes kept for 17½ days showed infective larvae, the rate being 20% (4 out of 20).]

After reviewing the results obtained in similar investigations by other workers in New Guinea [this *Bulletin*, 1958, v. 55, 74; 1959, v. 56, 1167; 1960, v. 57, 501], the author suggests that *C. p. fatigans* is not an efficient vector of *W. bancrofti* in New Guinea "despite its recent acceptance as such by Dutch workers".

[The reviewer considers that generalizations based on any one experiment are unjustified. Strain differences in parasite and in mosquito make it unlikely that an artificial feeding experiment can do more than indicate the susceptibility of one strain of vector to one strain of parasite. Even when many such experiments have been made, the final measure of vector importance must be the transmission index, the combination of biting rate and infective larva rate.]

T. Wilson

Taylor, Angela E. R. **Observations with the Ultropak Microscope on Microfilariae of *Litomosoides carinii* circulating in the Liver of a Cotton-Rat, before and after the Administration of Hetrazan.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Sept., v. 54, No. 5, 450–53, 1 fig. & 1 pl.

By means of an Ultropak microscope, an arrangement was made to view the liver capillaries of living cotton-rats infected with *Litomosoides carinii*. The microfilariae could be seen swimming in the moving blood; if they got caught up in the bends of fine capillaries they could wriggle back even against the flow of blood. Before diethylcarbamazine (Hetrazan) was given, there were 20–75 microfilariae crossing the microscope field per minute, each taking about 1–13 seconds to do so; after diethylcarbamazine 50 mgm./kgm. had been given intravenously, only 2–3 crossed the field per minute and they took up to 600 seconds and more to do so. The immediate effect of injecting diethylcarbamazine intravenously was that one or two microfilariae began to adhere

to the capillary walls and within 5 minutes most of them had adhered, usually by their tails. They remained in this position often wriggling actively for anything between 4 and 60 minutes. Sometimes a leucocyte was attached to the tail of a stationary microfilaria. These observations support the findings of HAWKING *et al.* [this *Bulletin*, 1950, v. 47, 1019] that diethylcarbamazine removes microfilariae from the blood by causing them to be fixed in the liver.

F. Hawking

VAN THIEL, P. H., KUIPERS, F. C. & ROSKAM, R. T. **A Nematode Parasitic to Herring, causing Acute Abdominal Syndromes in Man.** *Trop. & Geograph. Med.* Amsterdam. 1960, June, v. 12, No. 2, 97–113, 15 figs. & 1 graph. [18 refs.]

Between 1955 and 1959, 10 previously healthy adults in Rotterdam and Schiedam and one person in Hilversum were suddenly attacked by violent abdominal colic, the condition being so acute that in every instance laparotomy and resection of the gut had to be carried out, and in 9 of the patients this had to be done within 24 hours of the onset of the symptoms. In all 11 patients the cause of the inflammation and oedema of the gut (leading to occlusion of the small intestine) was found to be an immature nematode worm which had bored deeply into the gut wall. "The nematode was identified as *Eustoma* (*Anacanthocheilus*) *rotundatum* (RUDOLPHI, 1819), belonging to the family of *Heterocheilidae* super-family *Ascaroidea*. The larva lives in cod, haddock, herring and mackerel, the adult worm probably in shark and ray."

The above is a bare summary of the facts and gives no indication of the fascinating story of how, by a series of painstaking and ingenious investigations, the immature nematode was finally identified and the sequence of events, which led to its ingestion by the victim, was finally disclosed. This interesting and important paper is ably presented and well illustrated.

[See also this *Bulletin*, 1960, v. 57, 621.] *R. M. Gordon*

GRENIER, P. & FERAUD, L. Étude biométrique et morphologique de la croissance larvaire chez *Simulium damnosum* Theobald. [**Biometric and Morphological Study of Larval Growth in** *Simulium damnosum*] *Bull. Soc. Path. Exot.* 1960, May–June, v. 53, No. 3, 563–81, 3 figs. [12 refs.]

AURIZI, A. Ricerche sulla presenza di elminti nel cieco e nell'appendice di individui deceduti oltre i 60 anni. [**Helminths in the Caeca and Appendices of Persons who died at the Age of 60 Years or More**] *Parassitologia.* Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 13–14.

The English summary appended to the paper is as follows:—

"The author reports the results of post mortem examinations of appendix and caecum of 100 individuals 60 years old or older, dead in hospitals of Rome.

"*Enterobius vermicularis* was present in 14% of cases (12·95% women, 15·22% men) and *Trichuris trichiura* in 20% (14·81% women, 26·09% men)."

POLISH PARASIT. SOC. I Miedzynarodowa Konferencja w sprawie trychinellozy, Warszawa, 12–13.9.1960. [**1st International Conference on Trichinosis, Warsaw**] *Wiadomości Parazytologiczne*. Wrocław. 1960, v. 6, No. 4. 291–378, illustrated. English abstracts.

The first international conference on trichinosis, held in Warsaw in 1960, was attended by 112 participants, and the entire number of the journal is devoted to the publication of summaries in English, Russian, Polish, French and German of the papers delivered at the meetings, which were so numerous as to preclude individual notice. The proceedings were divided into 4 sessions, the first of which was devoted to 15 papers on the incidence of *Trichinella spiralis* in various countries of the world, with particular reference to Poland. In the United States the incidence of human trichinosis has steadily declined, from 487 cases in 1948 to 178 in 1957, an incidence of approximately 1 per 1,000,000. In Canada the infection is uncommon except in the Arctic, where the incidence among polar bears, foxes, walrus and Eskimos is very high. Infection was found at autopsy in 42 of 1,014 (4·14%) persons dying from various causes in Warsaw hospitals in 1959–60, and it is concluded that infection took place during the war. The parasites were found in 11 of 220 cats (5%) examined in Warsaw and in 1 of 1,647 rats examined in Szczecin. Foxes were also affected (17 of 60 examined, 25·8%), and wolves (all 5 examined).

The second session was devoted to the control and epidemiology of trichinosis; 9 papers were presented, but abstracts of only 5 are published, which deal mostly with the occurrence of foci of human and animal trichinosis in Russia, and the part played by birds and insects in the transmission of the infection. In an investigation of 8,683 wild mammals of 34 species caught in Siberia in 1958–60 *T. spiralis* infection was found in all of 5 wolves investigated, 69 of 337 foxes (20·4%), 9 of 87 *Mustela sibirica* (10·3%), and also infrequently in a number of other species, mostly insectivores. Of 6,589 rodents investigated only 1 was infected.

At the third session 22 papers were read on the pathogenesis, clinical aspects and diagnosis of trichinosis. The allergic basis of the manifestations of the disease was discussed. Elevation of serum aldolase and transaminase activities was observed in 30 patients, rising to a maximum 4 weeks after the onset of illness and returning to normal after 7 weeks. Some correlation was noted between the extent of the increase in enzyme activity and the severity of the disease. A decrease in serum albumin was observed in rabbits suffering from experimental trichinosis, with some increase in alpha and gamma globulins. The clinical aspects of outbreaks of trichinosis which occurred in Bydgoszcz in 1959 (308 cases) and in Chorzow in 1960 (101 cases) are described. The early development of *T. spiralis* was studied in experiments carried out on 800 mice. Larvae were first recovered on the 6th day after infection and increased in numbers up to the 13th day; any drug which is intended to reduce the number of larvae deposited in the muscles must therefore be given within 13 days of infection in order to be effective. Other papers deal with the treatment of the disease with cortisone and corticotrophin, and diagnosis by means of serological and allergic tests. Positive results were obtained with the intradermal test in 28 of 120 workers in the meat industry in Lodz, and in 25 of 120 hospital patients in the same town. A urine precipitation test with immune serum for the early diagnosis of trichinosis is described.

The last session was devoted to the morphology and biology of *T. spiralis* and consisted of 11 papers, 8 of which are published in abstract. The second paper, on the development and structure of the capsule, is illustrated with 8 electron micrographs, and other communications deal with experimental studies of infection in laboratory animals. *D. J. Bauer*

TRAWINSKI, A. Nowa metoda masowego badania wieprzowych tusz miesnych na obecnośc larw włośni za pomocą odczynu wykłaczania w żelu. [**A New Method of Mass Inspection of Pig Carcasses for the Presence of** *Trichinella spiralis* **Larvae by means of the Gel Flocculation Test**] *Ann. Univ. Mariae Curie-Skłodowska.* Lublin. Sect. DD. 1958, v. 13, 25–30, 2 figs. on pl. English summary.

Flocculation, complement-fixation and intradermal tests are useful for diagnosis of trichinosis in pigs, the first-named in pigs under one year old and the other two in older pigs. However, the tests are impracticable for mass examination of pigs in slaughterhouses for various technical reasons: they are time consuming, need much experience and the macroscopic flocculation test requires 0·3 ml. of antigen per pig.

The author describes a gel flocculation test with which 80 pigs can be examined in an hour, with a total of only 2·5 ml. of antigen. 1·75% melted agar (*p*H 7·4) containing 2·25 ml. of *Trichinella spiralis* antigen diluted 1/100 is poured into a sterile 10 cm. Petri dish and small cups of 0·5 cm. diameter are cut out of the solidified agar. The disks thus removed may be melted and used in a smaller Petri dish, so that the larger dish contains 50 cups and the smaller 25. 3 to 4 drops of serum from a slaughtered pig are dropped into a cup and left for 10 minutes at 37°C. or 20 minutes at room temperature. When the result is positive, delicate floccules appear, first at the periphery and later throughout the serum. They may be seen with a × 10 hand lens: after another 10 minutes they may be seen with the naked eye. Control cups contain positive and negative sera. Comparative tests with trichinoscopy are being carried out.

The appearance of the agar plates and of a positive result are shown in photographs. *H. J. O'D. Burke-Gaffney*

DEFICIENCY DISEASES

BOURNE, G. H. & WILSON, E. M. H. **World Review of Nutrition and Dietetics.**

This book was reviewed in this *Bulletin*, 1960, v. 57, 1238.

WOODRUFF, C. W. & HOERMAN, K. **Nutrition of Infants and Preschool Children in Ethiopia.** *Pub. Health Rep.* Wash. 1960, Aug., v. 75, No. 8, 724–30, 2 figs. & 1 chart.

Records of nutrient intake were obtained by questioning mothers of 133 children, aged up to 5 years, in Addis Ababa—a selected sample mostly from children attending hospitals and clinics. 51% of the children were boys.

Nearly three-quarters of the infants were breast-fed for 1 year, more than half for 18 months, and 40% for 2 years. Supplements to breast-feeding were of three types: some modification of cow's milk; sugar, cereal and tea; and foods from the family diet. At 6 months, 86% received cow's milk, often as 2 or 3 tablespoonfuls (=English dessertspoonfuls or half tablespoonfuls) of powdered milk greatly diluted, but sometimes as much as 1 litre of fresh or evaporated milk. Supplementary milk progressively decreased; by 3–5 years less than two-thirds received any form of milk, and that usually in small amounts. That 18% were not breast-fed up to 3 months, and that supplementary milk was often given in the first year, may reflect the selection of the sample from urban clinics.

Children were weaned over varying periods mostly at 2–3 years, to bread, "injera"—a local cereal pancake—and "wat"—a stew of potatoes, pulses, onions, occasionally with meat, seasoned with red pepper and garlic; only a very few had any fruit or eggs. One-fifth had nothing but milk even after 2 years of age; others received only those foods provided by the family diet; 17% over one year had received beer; 12 had received synthetic vitamins, usually as occasional vitamin A and D capsules. Geophagy was noted in children aged one year.

Samples of capillary blood were taken from 100 of the 133 Addis Ababa children, from 39 other Ethiopian infants and pre-schoolchildren whose feeding practices were unknown, and from 19 schoolchildren aged 6–17 years. These were examined by the United States Navy Medical Research Unit in Cairo, the results being presented in tables. Median capillary blood values (with the range in the 10–90 percentile shown in brackets) were:—packed cell volume—40 (32–46)%; ascorbic acid—0·08 (0·00–0·65) mgm./100 ml.; alkaline phosphatase—6·5 (4–11) nitrophenol units; serum-albumin—3·2 (2·4–3·8) gm./100 ml.; total globulins—3·99 (2·39–5·91) gm./100 ml.; gamma globulin—1·30 (0·65–2·05) gm./100 ml.

The laboratory assessments lead to a number of conclusions on nutritional status. Anaemia was relatively uncommon. The intake of ascorbic acid resulted in high levels in only 5%, and deficient levels in 65% of the children. Alkaline phosphatase was raised in 11–26% of the pre-schoolchildren, but in only one schoolchild. The serum proteins showed greater variability than would be expected in healthy persons, with an excess of low and high values. Serum albumin was abnormally low in one-half of the infants, and one-quarter of the pre-school and schoolchildren. The median gamma-globulin value was 0·85–0·9 gm./100 ml. in the artificial and breast-fed Addis Ababa children, rising to 1·45 in the pre-school, and 1·87 in the 6–17-year-old children elsewhere. The frequency distribution of children with gamma globulin $> 1{\cdot}2$ mgm./100 ml. was 0% of breast-fed and 33% of artificially-fed Addis Ababa children; and in other Ethiopian children 79% of pre-school and 100% of schoolchildren aged 6–17 years. It is suggested that the increases in gamma globulin may be due to increased risks of infection, and that this seems more likely to occur in artificial feeding.

Height and weight charts are given, to show that the rate of growth is satisfactory up to about 5 or 6 months of age, but thereafter, up to the age of 6 years, the growth of Ethiopian children compares unfavourably with that of United States children. Growth was similar to that seen in areas where protein malnutrition is common, and feeding practices are unsatisfactory.

Clinically, *Ascaris,* gastrointestinal, and respiratory infections were common. The most common nutritional diseases in infancy were mild rickets, in children about 1 year of age, and protein malnutrition. Permanent rachitic deformities were rare, and clinical rickets disappeared after the age of 2–3 years, when children become active and more exposed to sunlight. Though severe dermatosis with red hair was not often seen, the association of oedema, marasmus, and diarrhoea was frequent. The incidence of other specific nutritional diseases was low, and scurvy, which occurs sporadically in Addis Ababa, was not seen. A comparison of clinical signs indicative of malnutrition found in 432 children under 4 years of age, with observations made on some 5,000 older children and adults, is presented in a table. *T. P. Eddy*

THOMSON, Florence A. **Child Nutrition. A Survey in the Parit District of Perak, Federation of Malaya.** *Bull. Inst. Med. Res. Fed. Malaya.* 1960, No. 10, pp. v + 73, 10 pls., 15 diagrams & 1 map. [59 refs.]

Dr. Thomson's report is a most interesting and informative one. Its importance is indicated by the fact that the Medical Correspondent of *The Times* devoted two columns to it (October 28, 1960) under the headlines of "Tragedy of Malnutrition in Rural Malaya. Complex Social Causes".

The survey was made in a remote district of Perak, most of which is accessible only by track or by boat. Out of a population of 10,865 and 2,377 households, 200 households containing toddler children were chosen at random, 50 in each of 4 villages. Family composition is described, a striking fact being the paucity of young men who tend "to drift to the urban areas in search of a more congenial life". The report gives an account of the economic and social background of the selected households, dealing with housing, water supply, property (including livestock), occupation and earnings. With a few exceptions, most of the families were living in poverty, with a cash income of less than 60 Malay dollars (£7) per month.

Food supplies and dietary habits, and the value of the diet in terms of calories and important nutrients, are considered in detail. The people live mainly on the rice they themselves grow, which may be home-pounded but is more usually taken to local mills for decortication. Supplements to the rice staple are scanty. Fish is not plentiful and consumption of meat and milk almost negligible. Pulses, green leafy and other vegetables, and fruits, are included in the diet, but only in small amounts. The author's finding that there is "low total calorie intake, low protein, especially animal protein, extremely low vitamin A, and low thiamine and riboflavin" was borne out by clinical observations. Apart from the most serious deficiency states, which are those associated with insufficiency of calories and protein, signs of avitaminosis A are common, as are also signs of thiamine deficiency and ariboflavinosis. Evidence of thiamine deficiency is most frequently seen in lactating women.

Various dietary customs accentuate the ill-effects of limited food supplies. The range of foods permitted to pregnant and lactating women is severely restricted and young children are rarely given eggs and fresh fish, because these are thought to "result in worms". Children are often fed most irregularly, and "The idea that specially cooked food is needed for the young child is not recognised, except in so far as the preparation of soft rice is concerned".

In this environment, as might be expected, kwashiorkor or protein malnutrition is prevalent in the toddler age-group. Of 200 toddlers examined, 19% had kwashiorkor and 44% "showed some signs pointing to a protein deficient diet". The clinical picture is almost identical with the familiar one seen in many other parts of the world, with peevishness, anorexia, oedema, hair and skin changes and liver enlargement. There is a striking similarity in the environment which in different countries leads to protein malnutrition and fairly close uniformity in its clinical manifestations. Again, there is in Malaya the usual finding that the infant does reasonably well during the first 6 months of life, as long as breast milk is sufficient; the dangerous period comes later, when suitable foods to replace or supplement breast milk are required, but not given.

Equally the measures needed to prevent protein malnutrition are much the same everywhere, a fact which makes the problem particularly suited for co-ordinated international study and attack. In Dr. Thomson's report various lines of action are directly recommended, or suggested by implication. These include further surveys to determine the prevalence of protein malnutrition elsewhere in Malaya, the extension of maternal and child health services with more attention given by these services to the toddler, and improvements in animal husbandry and agriculture which are the responsibility of services other than health. The report as a whole is a valuable addition to the growing literature on child nutrition in the tropics and sub-tropics. *W. R. Aykroyd*

JELLIFFE, D. B. & JELLIFFE, E. P. Patricia. **Prevalence of Protein-Calorie Malnutrition in Haitian Preschool Children.** *Amer. J. Pub. Health.* 1960, Sept., v. 50, No. 9, 1355–66, 2 figs.

Protein and calorie deficiency in Haiti was assessed by weighing, and clinical examination according to a nutritional schedule [Jelliffe *et al.*, this *Bulletin*, 1954, v. 51, 716] of 1,323 children—the whole population aged 1–3 years, in 24 rural villages and two urban slums. Clinical assessment took three main forms.

1. *Assessment by syndrome*

   Spot diagnoses were recorded of four syndromes with defined criteria for diagnosis: kwashiorkor—invariably with pretibial pitting oedema; incomplete kwashiorkor—a mild or pre-kwashiorkor without oedema; nutritional marasmus; nutritional dwarfing.

2. *Assessment by nutritional status*

   Three measurable physical signs were found potentially useful as nutritional public health indices:

   (1) Oedema shown by pitting from three seconds' pretibial moderate digital pressure, expressed as a percentage of positive findings as the oedema index. As oedema was a criterion for diagnosis of kwashiorkor, the incidences of the two were the same.

   (2) Standard biceps skinfolds and arm circumferences were measured for comparison with standard "low arm circumferences" and "low muscle circumferences" taken as 80% of the average levels for comparable Jamaican and normal Haitian children; the proportion of children with low circumferences by these standards is expressed as a percentage index.

   (3) Hair changes—sparseness, straightness, silkiness, and lightening of colour.

3. *Assessment by weight deviation*

Affected children were classified as 1st, 2nd and 3rd degree malnutrition, according to percentage deviation of weight below the mean for "normal" children of a comparable group as advocated by GOMEZ *et al.* [*ibid.*, 1957, v. 54, 199].

All the methods of assessment employed were found to have various limitations and errors which are discussed in detail, but they were considered to be mutually complementary, and there was a considerable parallelism between findings in the three categories. Assessment by syndrome, and observation of hair changes lacked the objectivity necessary for statistical comparison. The simplest and most reliable field methods proved to be: the oedema index; the Gomez weight classification; and the low arm circumference index. Junior staff can perform these tests with simple apparatus.

The survey showed that the oedema (or kwashiorkor) index was 7%; weight classification showed 37% with first degree malnutrition, 21% with second degree, and 3% with third degree, a total of 61%; an abnormally low arm circumference, probably related to poor muscle, was seen in 69%.

[The three categories of assessment overlap considerably, and parallel findings would be expected. For example, criteria for diagnosis of kwashiorkor include loss of weight and oedema, and poor muscular development is surely associated with loss of weight.] *T. P. Eddy*

HENDRICKSE, R. G. & BREW, D. St. J. **Rickets and Polycystic Disease of the Kidney.** *West African Med. J.* 1960, Oct., v. 9 (n.s.), No. 5, 215–18, 3 figs.

"The clinical features and autopsy findings in a case of rickets associated with congenital polycystic disease of the kidney in a six-month-old Yoruba female are described. The pathogenesis of the bone changes is briefly discussed."

See also p. 234, KHATTAB & BASMY, **Studies on Eosinophilia in Parasitic Diseases and Pellagra.**

SPRUE

THURLBECK, W. M., BENSON, J. A., Jr. & DUDLEY, H. R., Jr. **The Histopathologic Changes of Sprue and their Significance.** *Amer. J. Clin. Path.* 1960, Aug., v. 34, No. 2, 108–17, 8 figs. [15 refs.]

It has now been firmly established that histological changes occur in the jejunal mucosa in cases of non-tropical as well as in tropical sprue. This is a recent development as the result of biopsy studies.

A review was made of all surgical and post mortem tissue received during the 5-year period before February 1959 from patients in the Massachusetts General Hospital with a diagnosis of non-tropical sprue, or severe malabsorption. This consisted of 12 Shiner tube biopsies, 11 surgical biopsies and 4 autopsies on 21 patients. 5 Shiner tube biopsies and 6 surgical biopsies from 11 patients served as controls. These included 5 patients with duodenal ulcer, 2 with malnutrition (after partial gastrectomy), 1 with anorexia nervosa and 3 with no disease. The biopsy material was fixed in formalin within 3 minutes of excision and subsequently transferred to a fixative containing dichromate.

The following points were noted: the heights of the villi, depths of crypts, heights of cells as measured by a micrometer. The recorded heights of cells of villus and crypt epithelium were the mean heights of the epithelial covering of the tip and adjacent sides of the villus and of the bottom of the cysts respectively. Counts were made of mitoses, and of Paneth and argentaffin cells in the crypts and counts of goblet cells on the villi. 10 villi and 10 crypts were examined in each specimen. The chief difficulty was the scarcity of areas cut at right angles to the mucosal surface.

In the normal jejunum the villi project into the lumen, whereas the crypts are pits between the bases of the villi. The distinction is largely lost in sprue. In control biopsies the villi of the proximal jejunum were finger-shaped, ranging from 260–470μ in length. The lining epithelial cells were tall and columnar, with well-marked brush border: their heights varied from 23 to 42μ. The mean number of goblet cells in one plane of the villus ranged from 4 to 29. The depth of the crypts ranged from 120 to 260μ: the average cell heights were 15 to 23μ.

Biopsy specimens were removed from 21 patients with steatorrhoea and they could be divided into two categories—those with the histopathological findings of sprue (12 patients) and those without (9 patients). In the first category there were 3 cardinal changes:—shortening of the villi, elongation of the crypts and an increased infiltrate of inflammatory cells. The pre-operative diagnosis in all these patients was non-tropical sprue. In all instances the villi were shortened varying from moderate degree to almost complete absence of villi. The villi ranged from 75 to 200μ in length. The lining epithelium manifested some distortion, with the lining cells more cuboidal in shape. The flattening of the lining epithelium was most conspicuous in the patients with the greatest shortening of the villi. The crypts were increased in depth and the measurement varied from 210 to 450μ. In one patient tissue biopsies from the jejunum and mid-ileum demonstrated changes of sprue in the former but not in the latter.

Nine patients in the second category had no "sprue changes" histologically, but 2 had Whipple's disease.

The results confirm the fact that easily recognizable changes are observed in the majority of patients who are diagnosed clinically as having sprue. These changes do not seem to result from malabsorption, since patients with severe malnutrition or secondary malabsorption do not show them. One well-established feature in the cases of sprue was the increase in length of the crypts accompanying the shortening of the villi. The change of sprue did not consist of mucosal atrophy. The destruction of the villi may be brought about by an inflammatory jejunitis.

Severe malabsorption may be present with the changes described above, but limited to the jejunum.

There appears to be no correlation between the degree of malabsorption and the anatomical change. 3 patients with malabsorption had negative jejunal biopsy findings. It is suggested that the diagnosis of sprue be limited to patients with malabsorption and the anatomical changes described.

[See also this *Bulletin*, 1960, v. 57, 1206.] *Philip Manson-Bahr*

HAEMATOLOGY

CHATTERJEA, J. B. **A Brief Review of the Hematologic Literature from India (1959).** *Blood.* 1960, Sept., v. 16, No. 3, 1351–5. [38 refs.]

SEN, S. C. **Haematological Studies on Normal Adult Individuals of Madhya Pradesh.** *Indian J. Med. Res.* 1960, May, v. 48, No. 3, 363–70. [18 refs.]

The common haematological parameters were determined for healthy students (300 male, 100 female) and for 100 males in the general population of Madhya Pradesh. Hb was estimated by the acid haematin method, and there is no statement as to how this was standardized, but the values for the mean corpuscular haemoglobin concentration as calculated from the mean Hb and red cell count figures given are about normal—for the male groups 34·3% and 34·7% respectively, and for the females 30·9%. Thus the mean Hb values would be roughly comparable with other modern figures, and they are (in gm./100 ml.) 14·99 for male students, 14·46 for the males in the general population, and 11·07 for female students. Total leucocyte counts were in the normal range, but the granulocytes were somewhat reduced, being for the above groups 3,315, 4,010, and 4,040 per cmm. respectively. The erythrocyte sedimentation rate, both by Wintrobe's and Westergren's method, was slightly raised in all groups, especially the women. *Alan B. Raper*

See also p. 233, FOY & KONDI, **Hookworms in the Aetiology of Tropical Iron Deficiency Anaemia. Radio-Isotope Studies.**

CHATTERJEA, J. B., BANERJEE, D. K. & HOSAIN, F. **Gastric Intrinsic Factor in Nutritional Macrocytic Anaemia.** *J. Ass. Physicians India.* 1960, Sept., v. 8, No. 5, 489–92. [10 refs.]

As part of a study of adequately diagnosed cases of megaloblastic anaemia in Indians, 5 patients whose vitamin B12 level in the serum was low were found able to absorb B12 labelled with ^{60}Co normally, and their absorption was not improved by the administration of intrinsic factor. 4 patients had a normal serum B12 level; in 2 of them B12 absorption was normal, but in 2 it was low and could not be improved by intrinsic factor. The main conclusion of this part of the study was that these patients showed no inadequacy of intrinsic factor. *Alan B. Raper*

METZ, J., LEWIS, S. M., KEELEY, K. J. & HART, D. **The Absorption of Vitamin B_{12} in Megaloblastic Anaemia associated with Pregnancy.** *J. Clin. Path.* 1960, Sept., v. 13, No. 5, 394–5.

"The absorption of $^{60}CoB_{12}$ has been studied in a group of patients suffering from megaloblastic anaemia associated with pregnancy and in a control group.

"The mean urinary excretion of $^{60}CoB_{12}$ in the patients with megaloblastic anaemia is not significantly different from that of the control group. Five of the 30 patients showed a value towards the lower limit of normal, but the serum vitamin B_{12} content in this group was within the normal range.

"Malabsorption of vitamin B_{12} does not appear to play a significant role in the pathogenesis of this form of megaloblastic anaemia."

GILLES, H. M. & IKEME, A. C. **Haemoglobinuria among Adult Nigerians due to Glucose-6-Phosphate Dehydrogenase Deficiency with Drug Sensitivity.** *Lancet.* 1960, Oct. 22, 889–91.

Apparent blackwater fever occurs occasionally in adults in holoendemic malarial regions, and it has been suggested already by the senior author and colleagues that some of these incidents may really be bouts of haemolysis induced by drugs [this *Bulletin*, 1960, v. 57, 514]. They now report 3 brief case histories that support that view, from a population in which 20% of the males show a deficiency of glucose-6-phosphate dehydrogenase (G6PD).

3 young adult male Yorubas passed dark urine after 2–3 days of premonitory symptoms of headache and pains in the trunk. Common to all the patients were a negative Coombs test and the absence of cold agglutinins, and the presence of oxyhaemoglobin in the urine. Only 1 patient had a few *Plasmodium falciparum* rings in the blood smear, and in another methaemalbumin was found in the plasma. The rapid screening test for G6PD in erythrocytes showed in each case a low level of enzyme activity. 2–3 days before the onset one patient had eaten mothballs, and the other 2 had taken aspirin, phenacetin and caffeine.

Since present indications are that the gene for G6PD deficiency is especially common in Africa where malaria is most prevalent, it is recommended that when "blackwater" appears in adults in such regions, special attention should be paid to a history of drug-taking, and a screening test for G6PD should be carried out. *Alan B. Raper*

DJALDETTI, M. & KLIBANSKI, C. **[Thalassaemia Minor in a Yemenite Jew]** *Harefuah.* Jerusalem. 1960, Oct. 2, v. 59, No. 7 [in Hebrew 207. (10 refs.) English summary 207].

The English summary appended to the paper is as follows:—

"The first case of Thalassemia minor in a Yemenite Jew is described. There was slight hypochromic anemia, target cells, decreased osmotic fragility, increased Hemoglobin A_2 fraction and slightly increased alkaline resistance. In addition the patient had schistosomiasis of the liver."

McFarland, W. & Pearson, H. A. **Thalassemia in "Non-Mediterranean" Families.** *Ann. Intern Med.* 1960, Sept., v. 53, No. 3, 510–22, 8 figs. [24 refs.]

Until recently the diagnosis of thalassaemia was open to doubt when patients presented sporadically and were not of Mediterranean [or Asian] stock. The authors were able to find 6 adults in Bethesda, Maryland, in whom they established the diagnosis of thalassaemia by finding a refractory hypochromic anaemia with a high serum iron, a raised Hb A_2 content, and no abnormal haemoglobins. The national origins of these subjects were respectively English, Danish, English-French, Negro, Filipino, and Scottish.

[Only the first-mentioned subject had anaemia severe enough to produce symptoms and require regular blood transfusions; presumably the others would be sufferers from thalassaemia minor of varying severity.] *Alan B. Raper*

Bütikofer, E., Hoigné, R., Marti, H. R. & Betke, K. Hämoglobin-H-Thalassämie. Mitteilung eines Falles mit Familienuntersuchung. [**A Case of Haemoglobin-H-Thalassaemia with Family Study**] *Schweiz. Med. Woch.* 1960, Oct. 22, v. 90, No. 43, 1215–17, 5 figs. [18 refs.]

The English summary appended to the paper is as follows:—

"A 29 year old woman of south Italian origin was found to have hemolytic anemia due to Hemoglobin-H-Thalassaemia. In the patient's mother and brother Thalassaemia minor could be identified by an increased level of Hemoglobin A_2."

Mukherjee, A. M., Sen Gupta, P. C. & Chatterjea, J. B. **Histopathology of the Liver in Thalassaemia Syndrome.** *J. Indian Med. Ass.* 1960, Oct. 1, v. 35, No. 7, 291–6, 5 figs. on pl. [11 refs.]

The Calcutta School continues its enquiry into haemoglobinopathic states with this paper on liver morphology, which, like preceding papers, deals predominantly with Hb E/thalassaemia. The liver was studied in biopsy specimens. It is not stated that the subjects had not received transfusions, though this may be inferred.

Iron granules were constantly present in liver cells, chiefly in the periportal region; there was always less marked deposition in the Kupffer cells. Neither the fatty changes nor the foam cells seen in autopsy material were found. Erythropoietic activity of some degree was present in 16 of the 18 livers examined, though it was only intense in one. There was no significant fibrosis in any specimen. In this last respect the authors contrast thalassaemia and pernicious anaemia on the one hand with haemochromatosis (idiopathic and secondary) on the other. In both groups of disease there is iron deposition in the liver; but this only leads to fibrosis in the second group, in which it is remarked that the deposited iron comes directly from external sources.

Alan B. Raper

WOLFF, J. A., SITARZ, Anneliese L. & VON HOFE, F. H. **Effect of Splenectomy on Thalassemia.** *Pediatrics.* Springfield, Ill. 1960, Oct., v. 26, No. 4, 674–8, 1 fig. [11 refs.]

A review of thalassaemic children treated over the last 29 years in the Babies Hospital and Department of Paediatrics, Columbia University, produced 24 cases, of whom 18 had been submitted to splenectomy at ages from 1½ to 18½ years. The paper deals especially with the results of this operation. There was one death at operation. All the other children required fewer transfusions after the operation, the best results being in 2 children who needed no further transfusions, and in 1 child who required none for 5 years. 7 splenectomized patients aged 8–34 years had died during the period, 5 from congestive heart failure, 2 of them with heavy deposits of iron in the myocardium. 3 had a terminal pericarditis. It is of interest that 1 child had a *Salmonella typhi-murium* septicaemia, with recovery.

The authors do not think that the hazards of pericarditis, meningitis, and other infections are increased by splenectomy. [Except for this opinion, their views on the value of splenectomy are very similar to those of SMITH *et al.*, this *Bulletin*, 1960, v. 57, 842.] *Alan B. Raper*

GELFAND, M. **Sickle Cell Anaemia in an African Infant from Northern Rhodesia.** *Central African J. of Med.* 1960, Sept., v. 6, No. 9, 401–2, 3 figs.

MARTIN, R. Les lésions radiologiques de la sicklanémie. (A propos de 28 observations.) [**Radiological Lesions in Sickle-Cell Anaemia**] *Méd Afrique Noire.* Dakar. 1960, July 1–15, v. 7, No. 13, 283–4, 4 figs.

The radiological appearances of bone lesions in cases of sickle-cell anaemia are placed in five groups by the author who has studied X-ray plates from 28 patients with this disease in French West Africa:

(1) translucent circular areas which are due to rarefaction, are often bilateral and are most commonly seen in the small bones of the hands and feet;

(2) increased density and thickening of the cortex of long bones; in one case osteomyelitis with a sequestrum was found;

(3) periostitis with new bone formation;

(4) cases in which both rarefaction and new bone formation are present;

(5) irregular notching and condensation along the sides of the metaphyses, especially of the bones of the extremities.

The author considers bone lesions to be a common complication of sickle-cell anaemia in children. He believes that such bones, having medullary hyperplasia and many areas of infarction, in anaemic subjects, are especially liable to bacterial infection. The earlier bone lesions, often multifocal and symmetrical and affecting the short bones of the hands and feet, are probably capable of recovering. *S. Bell*

AKSOYCAN, N., ÖZSOYLU, S. & GÜLMEZOGLU, E. **Salmonella Muenchen Osteomyelitis in a White Boy with Sickle Cell Disease.** *Turkish J. Pediatrics.* 1958, Nov.–Dec., v. 1, Nos. 5/6, 162–7. [11 refs.]

RAMOT, Bracha, FISHER, Sharon, REMEZ, Dina, SCHNEERSON, Rachel, KAHANE, D., AGER, J. A. M. & LEHMANN, H. **Haemoglobin O in an Arab Family. Sickle-Cell Haemoglobin O Trait.** *Brit. Med. J.* 1960, Oct. 29, 1262–4, 5 figs.

2 children in an Arab family in Israel exhibited in their erythrocytes haemoglobins S, O, and A, as well as a considerable amount of Hb F (10% and 28% respectively). Each showed a moderate anaemia, morphologically resembling sickle-cell anaemia. 5 other members of the family were tested; the parents were phenotypically AS and AO, and the genes for S and O segregated independently in the 4 children tested.

The authors have reason to believe that Hb O [this *Bulletin*, 1958, v. 55, 1165] has an abnormality in the β-chain; so, however, has Hb S. According to current concepts, therefore, the doubly affected children had no means of forming normal β-chains by the usual genetic mechanism. Yet they both formed electrophoretically normal Hb A. The normal β-chains required for this must have been due to the activity of another locus. An explanation of this is promised in a later report. *Alan B. Raper*

VENOMS AND ANTIVENENES

OHSAKA, A., IKEZAWA, H., KONDO, H., KONDO, S. & UCHIDA, N. **Haemorrhagic Activities of Habu Snake Venom, and their relations to Lethal Toxicity, Proteolytic Activities and other Pathological Activities.** *Brit. J. Exper. Path.* 1960, Oct., v. 41, No. 5, 478–86, 9 figs. (7 on 2 pls.) [16 refs.]

" The venom of *Trimeresurus flavoviridis* (Habu), a crotalid, was fractionated on a large scale by zone electrophoresis in a packed starch column. Haemorrhagic activity, lethal toxicity and proteolytic activity in each fraction were determined quantitatively.

" It was found that at least 2 haemorrhagic principles, designated as HR1 and HR2, were involved in this venom. HR2 could be separated from the main part of lethal toxicity. Both HR1 and HR2 were associated with proteolytic activity on casein.

" Histopathological observations indicated that the muscle degeneration effect was related neither to haemorrhagic activity nor to proteolytic activity on casein, as far as herein tested."

[See this *Bulletin*, 1960, v. 57, 1106.]

BROWNE, S. G. **Cantharidin Poisoning due to a "Blister Beetle".** [Memoranda.] *Brit. Med. J.* 1960, Oct. 29, 1290–91, 2 figs.

Cantharidin occurs in widely distributed genera of "blister beetles" (*Mylabris, Epicanta, Cyanolytta* and *Cercoctis*). This fact is widely recognized by orthodox toxicologists as well as by witch doctors in some African countries [this *Bulletin*, 1933, v. 30, 604; 1948, v. 45, 551].

This paper concerns an African male child, aged 22 months, brought to the Leprosy Research Unit Clinic at Uzuakoli, Nigeria, with the story that blebs had suddenly appeared on his hands and face, but, more especially, that he was passing frequently and painfully small amounts of blood-stained urine. The mother was asked if she had seen "Spanish flies" (*Lytta vesicatoria*) near the house. This she denied, but confessed that the previous day the boy with some companions had been conducting mimic races with brightly coloured beetles. The patient, in a fit of pique, had torn his losing beetle to pieces.

He suffered from pain in his left hand, lay down and later woke up in a screaming fit when blebs appeared on the fingers of the left hand, lower lip and gum. Later 2 appeared on the chin. During the night more blebs appeared, on the hands and neck, and with them dysuria and blood-stained urine. The skin around the blebs was tender. Similar bullae were noted on the inner aspect of the mother's right thigh. The child's urine contained much protein, numerous red cells and leucocytes.

Adequate alkalis were given by the mouth, calamine lotion was applied to the skin, and the lips were bathed frequently with an aqueous solution of acriflavine.

For 3 days the patient remained drowsy while the urinary symptoms persisted. Clotted blood and stringy mucus were passed. From the third day onward the quantity of protein in the urine and the blood began to diminish, but the urine did not become normal until the ninth day. Recovery was complete.

The dismembered offending beetle was identified as *Mylabris bifasciata*. In these beetles the cantharidin is present in the haemocele as well as in the elytra, genitalia and joint fluid. Their number varies within wide limits, though they appeared to be most frequently encountered in January.

The toxic principle seems to have been absorbed very rapidly through the intact skin and labial mucosa. The absence of symptoms in children who handled intact beetles is noteworthy. The mother's skin was probably contaminated by the child's soiled hand. The author comments on the persistence of the severe strangury and haematuria, despite the small amount of toxin absorbed and the adequate alkalinization. *Philip Manson-Bahr*

TOXOPLASMOSIS

MARINONI, F. & LAZZARO, G. Su un caso di toxoplasmosi umana in soggetto con reticolosarcoma. [**A Case of Toxoplasmosis in a Patient with Reticulo-Sarcoma**] *Parassitologia*. Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 221–2, 4 coloured figs. on pl. English summary (4 lines).

GAŁUSZKA, J., NAZAR, T., SZAFLARSKI, J. & WACŁAWEK, Dorota. Toksoplazmowy odczyn barwny Sabina-Feldmana u psów z Krakowa. [**The Examination of Dogs in Cracow with Dye Test for Toxoplasmosis**] *Wiadomości Parazytologiczne*. Wrocław. 1960, v. 6, No. 5, 425–7. [23 refs.]

The English summary appended to the paper is as follows:—

"The serum of 1050 clinically healthy dogs from the town of Cracow was examined with dye test (Sabin-Feldman).

"Positive result was noted in 33 cases (3.14 per cent)."

ROBERTSON, J. S. **Excessive Perinatal Mortality in a Small Town associated with Evidence of Toxoplasmosis.** *Brit. Med. J.* 1960, July 9, 91–6. [21 refs.]

This enquiry sprang from the observation that during 1956, 1957 and 1958 there were large differences between the stillbirth rates for three adjacent districts in North Lincolnshire. In Barton-on-Humber the stillbirth rate was 59·6 for the triennium, in the neighbouring town of Brigg the rate was 9·0 and in the surrounding rural district it was 28·1.

The enquiry was started by arranging for midwives to complete a questionary of all stillbirths, and from these it became apparent that in two-thirds of them the foetus was either malformed or macerated. This suggested that the cause must be non-obstetric and that genetic and environmental factor should be investigated. The considerable number of physical factors now known to predispose to congenital malformation were reviewed but none likely to be responsible could be found. A genetic cause seemed improbable for the stillbirth rate was higher in the town of Barton than in the surrounding small villages with their more inbred populations. Infective causes were therefore looked for and rubella, syphilis, influenza, and respiratory or ECHO virus infections were borne in mind, but it seemed that the most probable cause would be an infection whose rate of spread was slow and which was either symptomless or produced vague or minor illness. Brucellosis and toxoplasmosis were considered to fulfil best these latter criteria. An earlier study of blood donors in small towns and rural areas of Lincolnshire showed that in Brigg where the stillbirth rate was 9, only 10% of blood donors had a positive toxoplasma dye test whereas in Brigg rural district where the stillbirth rate was 28·1, 27% of blood donors had a positive toxoplasma dye test [this *Bulletin*, 1957, v. 54, 1121]. This enquiry had not included Barton-on-Humber and the 19 women resident there who had had stillborn babies during 1956, 1957 and 1958 were identified and traced. For each, control mothers of live babies born

in the same month were selected and, by a questionary, information was obtained regarding the obstetric history, consanguinity, work and illnesses during pregnancy, dental and medical treatment, anaesthetics, X-ray examinations, recreational habits and contact with animals. Toxoplasma dye tests and brucella agglutination reactions were assessed. The only significant difference between the two groups was that the toxoplasma dye test was positive in the higher dilutions much more commonly among mothers who had given birth to stillborn infants than among the controls. A higher incidence of malpresentation was found among infants who had been stillborn and this could have been related to the known tendency of toxoplasmosis to give rise to hydrocephalus or microcephalus.

[This was clearly a well planned and carefully conducted investigation and the result is of considerable value and interest, for toxoplasmosis has not in the past been regarded as a significant cause of stillbirths.] *A. W. Woodruff*

KOZAR, Z. W sprawie badań nad rolą toksoplazmozy w położnictwie. [**On the Investigations of the Role of Toxoplasmosis in Obstetrics**] *Wiadomości Parazytologiczne*. Wrocław. 1960, v. 6, No. 5, 399–414. [78 refs.] English summary.

YAHASHI, H. [**A Study of Toxoplasmosis in the Newborn, especially Premature Infants**] *J. Osaka City Med. Center*. 1960, Aug., v. 9, No. 8, 2547–57, 2 figs. [39 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

"On the study of toxoplasmosis, the dye test and intradermal reaction were examined for the new born, particularly premature babies, with the following results:

"1) The positive rates of the dye test for new borns showed no sex difference.

"2) When positive limits were over 1:4 on the dye test for new borns, the mature babies examined were positive in 5.6 per cent, premature babies in 20.4 per cent. With over 1:16, for new borns, mature babies showed 1.8 per cent and premature babies 7.4 per cent respectively.

"3) All new borns with malformations were positive on the dye test.

"4) Regarding the relationship between causes for premature birth and the dye test, 52.8 per cent of the premature cases had unknown birth causes, and 24.6 per cent were positive on the dye test.

"5) The dye test on premature babies revealed the lower the birth weight the higher the positive rate.

"6) Intradermal reactions for new borns were all negative.

"7) No Toxoplasma gondii were detected from the present examinees. One positive reactor with a high titer of 1:1024 was observed and the relation of toxoplasmosis to the high titer was followed, however, with no detection of Toxoplasma."

WERNER, H. & SEIDLITZ, P. Experimenteller Beitrag zur connatalen Toxoplasmose. 1. Mitteilung. Über den Befall der weiblichen Genitalorgane von Maus und Goldhamster durch *Toxoplasma gondii* nach intravenöser, intraperitonealer und intrauteriner Injektion. [**Experimental Contribution to Congenital Toxoplasmosis. 1. Infection of Female Genital Organs of Mice and Hamsters with** *Toxoplasma gondii* **after Intravenous, Intraperitoneal and Intra-Uterine Injection**] *Zent. f. Bakt.* I. Abt. Orig. 1960, v. 178, No. 2, 250–62, 12 figs. 2. Mitteilung: Über den Verlauf der *Toxoplasma*-Infektion in Uterus, Tube und Ovar von Maus und Goldhamster nach intrauteriner Injektion. [**2. Course of** *Toxoplasma* **Infection in Uterus, Tube and Ovary of Mice and Syrian Hamsters after Intra-Uterine Injection**] *Ibid.*, No. 3, 393–406, 12 figs.

————, with the technical assistance of P. SEIDLITZ & A. PIERZYNSKI. 3. Mitteilung: Über die Infektion des trophoblasten bei der Maus durch *Toxoplasma gondii*. [**3. Infection of Mouse Trophoblast by** *Toxoplasma gondii*] *Ibid.*, v. 180, No. 1, 118–35, 11 figs. [23 refs.]

The authors are unwilling to accept the view that congenital *Toxoplasma* infection takes place in the last third of pregnancy. They point out that the characteristic manifestations of hydrocephalus, microcephalus, intracerebral calcification and chorioretinitis indicate an earlier date, as does the repeated demonstration of *Toxoplasma* in anencephalic foetuses. In these instances the damage must have been done in the first third of pregnancy. They are also impressed by the discovery by REMINGTON *et al.* [this *Bulletin*, 1959, v. 56, 655] of a *Toxoplasma* cyst in uterine tissue. What, they ask, would happen if a fertilized ovum were to become implanted in a uterus already infected with toxoplasms?

Their first objective was to produce *Toxoplasma* infection in the genital tract. For this they used mice and hamsters and the BK strain of *Toxoplasma*, which killed the animals in 96 to 144 hours. 100 hours after intraperitoneal inoculation no toxoplasms were found in the genital organs, only a few after intravenous inoculation, but, after intra-uterine inoculation, large numbers were found in the uterus, the tubes and in the ovarian stroma but not in the ovarian follicles. Pseudocysts developed in the endometrium.

Having established that the intra-uterine was the best method of inoculation their next objective was to study the course of *Toxoplasma* infection of the genital tract. This they did by killing and examining mice at 2- to 3-hour, and hamsters at 7- to 22-hour intervals after inoculation. They found infection spread from epithelium to endometrium, muscularis, stratum vasculare and peritoneum. From infected endothelial cells of blood or lymph vessels it was carried to ovary, tubes and those parts of the uterus not already infected from the epithelium. Pseudocysts were found in the endometrium 65 to 72 hours after infection.

The next stage of the investigation was to find out what would happen to pseudocysts in the endometrium after implantation of a fertilized ovum. To do this toxoplasms were inoculated into the uterus of mice during dioestrus. 4 to 5 days later the animals were killed and examined. It was found that pseudocysts were released when the endometrium was broken down by the trophoblast. This might result in (1) formation of necrotic foci in the region

where the placenta would later be formed; (2) spread of toxoplasms to other organs by the blood stream; (3) entrance of toxoplasms into cells of the syncytiotrophoblast. Trophoblast cells were not destroyed by toxoplasms multiplying within them, but continued to take part in the formation of chorionic villi. During the maturation of these the parasite might enter foetal blood vessels.

Another possible route of infection is by the passage of toxoplasms from the amniotic fluid into the gastro-intestinal tract of the foetus.

By analogy the authors conclude that the earliest dates for human congenital infection are the 4th to 5th week, if transplacental, and the 4th to 8th week, if by amniotic fluid.

How toxoplasms reach the uterus is another question to which they are endeavouring to find an answer.

[These articles report a vast amount of careful work. They are illustrated by excellent photographs. Nomenclature is often a trouble and what the authors describe as "pseudocysts" or even "true pseudocysts" would be called by others "intracellular colonies". They are certainly very different from the cysts found in chronic infections. This does not, however, affect the authors' argument.] *C. P. Beattie*

SZYMANSKI, S. Metodyka eksperymentalnego zarażania kleszczy toksoplazmą. [**Methods of Experimental Infection of Ticks with** *Toxoplasma*] *Wiadomości Parazytologiczne*. Wrocław. 1960, v. 6, Nos. 2/3, 147–56, 3 figs. [10 refs.] English summary.

The author has developed two methods of infecting ticks with *Toxoplasma* without the use of laboratory animals. In the first method fertile eggs at the 8th–9th day of incubation are infected with toxoplasms from the peritoneal exudate of an infected mouse, and after further incubation for 3–4 days the shell over the air sac is removed and the ticks are inserted. The hole is covered with gauze and the egg is replaced in the incubator for 24 hours, during which time the ticks take blood from the vessels of the chorioallantoic membrane. By this method it was possible to infect *Argas persicus*, *Ornithodoros lahorensis*, *O. papillipes* and *O. coniceps*. Ixodid ticks could not be fed by this method, but could be infected by the second method, in which the ticks were fixed with plasticine and a capillary containing exudate was inserted into the mouth. In this way it was possible to infect *Hyalomma asiaticum*, *Dermacentor marginatus* and *D. pictus*. *D. J. Bauer*

VAN DER WAAIJ, D. **The Effect of a Lysine-Deficient Diet on the Course of a Chronic Toxoplasma Infection.** *Trop. & Geograph. Med.* Amsterdam. 1960, June, v. 12, No. 2, 180–82.

The author has investigated the process of multiplication of *Toxoplasma* cysts in the brains of mice. In order to reduce antibody formation in the host a lysine-deficient diet was used, because this essential amino-acid is required for the formation of gamma globulin, in which antibodies occur. The state of nutrition of each animal was roughly determined by weight at the end of the

experiments. Two groups of 24 mice were put on the deficient diet 8 weeks after infection with an avirulent strain of parasite. One group was then killed; the second group was used to study chronic toxoplasmosis during pregnancy. A third group of mice was heavily infected after 8 weeks of dieting, which was continued, and the results obtained were used to study the effect of diet on immunity. Control mice were fed on a normal diet. It appeared that increase in the number of cysts was retarded in mice on deficient diet, possibly owing to the fact that the parasites require lysine. The number of cysts present in brain was less than in mice on a normal diet. No pregnancies resulted in mice on deficient diet. *J. D. Fulton*

MATSUMOTO, H. [**A Study on Changes of Free Amino-Acids in the Serum of *Toxoplasma* Infected Mice from a Viewpoint of Essential and Non-Essential Amino-Acids**] *J. Osaka City Med. Center.* 1960, Aug., v. 9, No. 8, 2631–41, 7 figs. [10 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

"A study was made of a synchronous quantitative analysis of serum amino-acid of mice as to essential and non-essential aminoacid in various morbid stages of toxoplasmosis with following results:

"1) Total serum aminoacid value began to increase immediately after Toxoplasma infection showing a marked increase in the final stage.

"2) An essential aminoacid value in serum temporarily decreased immediately after infection showing an increase in the final stage. Such changes seem to be caused by a destruction of liver cells because of marked liver disturbances.

"3) A non-essential aminoacid value in serum began to increase immediately after infection showing a marked increase in the final stage."

DA SILVA, L. H. P. *In vitro* **Effect of the Aminonucleoside of Stylomycin and Dimethyl-Adenine against** *Toxoplasma gondii.* *Rev. Inst. Med. Trop. São Paulo.* 1960, May–June, v. 2, No. 3, 155–62, 10 figs. [17 refs.]

The aminonucleoside of Stylomycin and its purine base, dimethyladenine, have been tested against *Toxoplasma gondii* in tissue culture since the parent antibiotic had earlier been shown to possess activity [this *Bulletin*, 1954, v. 51, 430, 1190]. HeLa cells and trypsinized calf kidney tissue were used. The liquid phase consisted of Hanks solution with 0·25% lactalbumin hydrolysate and 10% inactivated calf or sheep serum. Antibiotics were added in Hanks solution and the *p*H maintained at 7·2–7·4. The toxic level of the drugs for the tissue cultures was first established in absence of *Toxoplasma* and 0·03 to 0·05 mM concentration of the aminonucleoside did not appear to damage the tissue cells but 0·03 mM concentration of Stylomycin was harmful. Infected exudate from mice was used to inoculate cultures and the drug was added in sterile Hanks solution. It appeared that the aminonucleoside was more inhibitory in tissue culture than its purine base, dimethyladenine. No reversion of the effect of the former was obtained by adding adenine, adenosine or deoxyadenosine with it to the culture medium.

The author concluded that the aminonucleoside moiety of Stylomycin was responsible for the activity of this substance against *Toxoplasma*, and dimethyladenine is less effective. Both act during the reproductive phase. The author and his colleagues had previously obtained similar results with *Trypanosoma cruzi* [*ibid.*, 1960, v. 57, 457]. The drugs had no effect on the extracellular parasites and failed to prevent penetration to the tissue culture cells. It appeared that the drug acted as an antagonist of purine nucleotide metabolism.

J. D. Fulton

DERMATOLOGY AND FUNGUS DISEASES

ARRU, E. *Tyroglyphus siro* (Linnaeus, 1758) causa di malattia nell'uomo e negli animali. [*T. siro* **as a Cause of Skin Disease in Man and Animals**] *Parassitologia*. Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 3–6. [12 refs.]

The English summary appended to the paper is as follows:—

"*Tyroglyphus siro* (Linnaeus, 1758) was identified by the author as the agent of a dermatitis which occurred among the personnel of the Centro di Studio per la Parassitologia Veterinaria. These people were dealing with a group of young calves bred artificially with cereal flours. Subsequent investigations by the author established the frequency of the parasite in the flours and other subproducts of the wheat, barley, oats, etc., destined for human and animal food in the town of Sassari."

CARRIÓN, A. L., SILVA HUTNER, Margarita, NADAL, H. M. & BELAVAL, María E. **Maduromycosis. An Unusual Case with a Description of the Causative Fungus.** *Arch. Dermat.* 1960, Sept., v. 82, No. 3, 371–83, 14 figs. Discussion 383–4.

In this report of a case of maduromycosis the authors describe a fungal isolate from lesions in the right lower leg.

The particular interest attaching to this as yet unidentified fungus is the diversity in its morphology and the diversity in the methods by which it is capable of reproducing itself.

In the tissues it presented as dark yellowish-brown masses resembling superficially the "grains" which are usually seen in maduromycosis, and which consisted of spherical, fumagoid, rounded or polyhedral elements measuring about 10 μ in diameter.

In culture, giant colonies were formed after 3 weeks' growth. These were dark in colour, with irregular margins and surface features which varied with the culture medium used. In hanging drops growth was yeast-like, but at 30°C. it became filamentous, and then became capable of pleurogenous sporulation resembling that found in *Pullularia*.

Various types of sporulation were observed in colonies maintained at 30°C. for 3 weeks, which were dark coloured and velvety. These included: clumps

of spores developed at the tips of branches or along the course of the fertile hyphae as in *Pullularia*; or, as in *Phialophora, i.e.* generated from the tips of phialides; or, as in *Cladosporium, i.e.* spores budded off in chains from primary conidia; and finally, according to the *Beauveria* pattern, *i.e.* generated along the course of a zig-zag filament terminating a basal branch.

In the discussion which followed the presentation of this paper doubt was expressed as to the purity of the cultures studied because of the diversity in morphology and reproduction described by the authors. It was however pointed out in reply that this phenomenon exists, and has been observed in cultures of other species grown from single spores.

The features are illustrated in numerous photomicrographs.

C. J. La Touche

MURRAY, I. G., SPOONER, E. T. C. & WALKER, Jacqueline. **Experimental Infection of Mice with** *Madurella mycetomi*. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, July, v. 54, No. 4, 335–41, 4 figs. on pl.

The successful inoculation of animals with the fungi found associated with mycetoma has hitherto proved extremely difficult, but BORELLI [this *Bulletin*, 1958, v. 55, 575] described typical grains in mice as a result of using a mixed inoculum consisting of *Madurella mycetomi* and *Blastomyces dermatitidis* or *Histoplasma capsulatum*.

The authors of this article carried out inoculation experiments in an attempt to confirm Borelli's results, but succeeded only in bringing about blastomycosis in mice. They then inoculated some mice intraperitoneally with a mixture of living *M. mycetomi* and killed tubercle bacilli, and thereby obtained large numbers of typical grains.

It was found that the toxicity of *M. mycetomi* is very low for mice, doses up to 25 mgm. being easily tolerated without apparent ill-effects. In fact it was found that mice carrying large numbers of grain-containing granulomata were still "in excellent health for up to 308 days"; but doses in a range increasing from 0·1 gm. to 0·2 gm. usually killed them in 4 to 10 days.

When small doses in the range from less than 1 to 10·0 mgm. were used survival in good health was the rule. Such mice, if killed at 14 to 30 days after being inoculated, contained lesions which were strictly confined to the peritoneal cavity. Mice inoculated with single doses of *M. mycetomi* alone produced grain-containing granulomata only occasionally, but these were more readily produced if multiple doses were administered or if mixed doses of *M. mycetomi* and killed tubercle bacilli were used. The best results were achieved by the use of this mixed inoculum, for, although the number of grains in individual mice was very variable, the number of mice which became infected by this method increased markedly when a given concentration of killed tubercle bacilli had been reached in the mixed inoculum. This was also the case when the concentration of *M. mycetomi* was increased in the mixture.

The authors are of the opinion that the similarity in the results obtained with multiple injections of *M. mycetomi* and with a mixture of this organism and killed tubercle bacilli suggests "that grain formation may be in some way related to stimulation of an immunity mechanism". *C. J. La Touche*

SKIPWORTH, G. B., BERGIN, J. J. & WILLIAMS, R. M. **Coccidioidal Granulomas of Skin and Conjunctiva treated with Intravenous Amphotericin B. Report of a Case.** *Arch. Dermat.* 1960, Oct., v. 82, No. 4, 605–8, 6 figs.

"A remarkable clinical improvement was evident in a case of coccidioidal granulomas involving the skin and conjunctiva with 5·1 gm. of amphotericin B administered intravenously over an eight-month period."

TROPICAL ENVIRONMENTAL CONDITIONS

BANNISTER, R. G. **Anhidrosis following Intravenous Bacterial Pyrogen.** *Lancet.* 1960, July 16, 118–22, 3 figs. [21 refs.]

4 healthy male volunteers were injected intravenously in pairs in 11 experiments with 0·1–0·45 μgm. pyrogen (a purified lipopolysaccharide from *Salmonella abortus equi*) during exposure to high temperature (92–95°F. Basic Effective Temperature). One individual of each pair acted as control.

Total weight loss, mainly due to sweating, was measured by accurate man balance, and sweat gland activity was further estimated by a plastic-impression method. When sweating stopped the effect of local intracutaneous acetylcholine was ascertained.

In all 4 subjects complete cessation of sweating occurred between 55 and 105 minutes after injection. Sweating could still be elicited by acetylcholine.

When a small dose of pyrogen, itself ineffectual, was repeated within 2 hours an exaggerated febrile response was obtained.

Pyrogen caused the same rise in body temperature when injected at two ambient temperatures differing by 20°F. Shivering was invoked at the lower temperature.

Pyrogens of naturally occurring febrile disease may contribute to heat stroke at high environmental temperatures. *M. L. Thomson*

MISCELLANEOUS DISEASES

LEATHER, H. M. **Glomerulonephritis in Africans in Uganda.** *Brit. Med. J.* 1960, June 25, 1930–38, 7 figs. [22 refs.]

No comprehensive clinical studies of glomerulonephritis have been made on Africans in their home environment and this study was carried out, therefore, to learn more of the clinical features, the biochemical and histological findings and the course of the disease in Bantus. Between January 1956 and February

1957, all patients admitted to the Medical Unit, Mulago Hospital, were studied in whom there was clinical evidence of renal disease or who were hypertensive.

Glomerulonephritis was found in 33 of the 67 patients in the study and was the commonest cause of renal disease in each of the first four decades. It occurred in 12 children of whom about half had enjoyed a fairly good diet. In 7 there was a history of a recent infection, usually the upper respiratory tract. The presenting symptom in all was swelling of the body, and in most the face or neck had first been involved. Urinary symptoms were not striking and no child gave a history of passing blood in the urine. Clinically oedema was marked and ascites was usually considerable. Albuminuria was invariable and considerable hypertension was present in 6. 2 children presented clinical evidence of malnutrition. A mild degree of anaemia was present in most instances. Serum electrophoresis revealed low albumin and an increase in the globulin fractions. The diagnosis was confirmed by renal biopsy in the 8 eldest patients. The prognosis in these children was thought to be poor.

Glomerulonephritis was found in 3 young men who complained of swelling of the body; none gave a history of haematuria. The blood pressure was raised in 2, in one of whose optic fundi linear haemorrhages were present. In these renal biopsy revealed changes of acute glomerulonephritis and a second biopsy 6–8 weeks later showed regression. Clinically, moderate improvement occurred with bed rest and a low-salt, high-protein diet. Hypertension, however, persisted and although the blood-urea level fell, it did not return to normal.

3 patients between the ages of 20 and 30 years had rapidly progressive glomerulonephritis with hypertension, uraemia and histological changes of acute nephritis in renal biopsy sections. One patient had subacute nephritis, one latent nephritis, 3 " intermediate " nephritis and 10 chronic glomerulonephritis. In the cases of chronic nephritis the diagnosis was confirmed histologically in all but one case. Congestive heart failure was the commonest mode of presentation in this group, oedema was usually slight to moderate, swelling of the face intermittent and severe retinitis was found among those whose diastolic pressure was 130 mm. mercury or more. A moderate degree of albuminuria was constant and microscopic haematuria was also always present though in most cases it was slight. Anaemia was a common finding, the haemoglobin varying between 22 and 83%. Some degree of azotaemia was present in all. The serum albumin values averaged 1·7 gm.% and the globulin 3·8 gm.%

It is stated that in Uganda it appears that glomerulonephritis in the Bantu is a disease of younger persons, that no sex distribution is evident and that among children the characteristic clinical pattern is of oedema, albuminuria, hypercholesterolaemia, hypoalbuminaemia, diminished serum albumin, increased serum globulin and hypertension. This uniform pattern contains features of both Ellis's Type 1 and 2 nephritis although the prognosis appeared to be more closely akin to that of Ellis Type 2 than to Type 1.

The aetiology is not clear but it was thought possible that in Uganda, as in Europe, the disease was aetiologically connected with streptococcus. The extreme degrees of oedema seen in some patients were thought to be due to gross hypoalbuminaemia caused in part by heavy losses of protein in the urine and in part by the low serum albumin values [this *Bulletin*, 1952, v. 49, 535] present at the beginning of the illness. Seven detailed case histories are given. [This is a very full paper and contains much interesting detail which should be read in the original.] *A. W. Woodruff*

FISTEIN, B. **Toxic Hypoglycaemia (Jamaican Vomiting Sickness). First Case reported from the Territory of Trinidad and Tobago.** *West Indian Med. J.* 1960, Mar., v. 9, No. 1, 62–6.

The author describes 2 cases of toxic glycaemia in malnourished, male, East Indians, aged 3½ and 4½ years. The first died 5½ hours after eating a morning meal, and the autopsy findings were consistent with those of Jamaican vomiting sickness (fatty liver). The second child became unconscious and developed hypoglycaemia (20 mgm./100 ml.) but recovered subsequently on intravenous therapy with glucose and vitamin B complex. Although ackees (*Blighia sapida*) are occasionally found in Trinidad, apparently none was ingested in this case (nor were "bush teas"), although various fruits, berries or plants may have been eaten by the toddlers. The author observes (as others have done) that hepatotoxic agents, other than the ackee, may produce acute hypoglycaemia and he stresses that prompt diagnosis, followed by treatment with glucose and vitamin B complex, may be life-saving. [Recent experimental work (unpublished) suggests that vitamin B may have a protective role in this condition.]

[See also this *Bulletin*, 1959, v. 56, 1280.] *K. R. Hill*

CEUTERICK, J. **Cancer of the Stomach in the Katana Region (Congo).** *Trop. & Geograph. Med.* Amsterdam. 1960, June, v. 12, No. 2, 119–26. [34 refs.]

Gastric carcinoma occurs throughout the world but its geographical distribution is as yet very imperfectly understood. The interpretation of the statistics in this connexion is not easy, as there are so many variable factors involved. In Africa, in particular, the figures so far published are insufficiently detailed to permit of direct comparisons. Some workers have stated that cancer of the stomach is a condition unknown among primitive people. But this survey presents a very different picture.

The area of the survey reported is Katana, in the eastern part of the Congo with a population of 91,712. There were 62 established cases of gastric carcinoma among a total of 260 malignant tumours diagnosed in the hospital. 32 men and 30 women made up this group who (apart from one woman of 28 years) were all between 40 and 55 years of age.

They presented themselves because of epigastric pain, worse after food, vomiting, haematemesis and cachexia. The tumour was palpable on first examination in 20% of patients. Radiology showed a large filling defect or advanced pyloric stenosis. This last was by far the main complication (over 50% of patients) that led to urgent seeking of medical help. In other words, the majority came too late for effective treatment. In only 20% was gastrectomy performed and gastroenterostomy in another 11%. Of those who could be followed up, 60% died in the first year after diagnosis.

The large majority of the tumours was found to be in or near the pyloric antrum. None had extended to the duodenum. The commonest was the annular ulcerating (crater) type which was present in 55%, whereas the polypoid

was present in 28% and the remainder were diffuse types. Of the 36 specimens subjected to biopsy, 24 were typical and 9 atypical epitheliomata, while 3 were linitis plastica. Direct extension of the growth into the liver, pancreas, gall bladder and transverse colon were all seen, and metastases in local lymph nodes were present in half the cases.

This small survey indicates a frequency of 23·8% of gastric among all cancers in contrast to other figures for Central Africa as low as 2·6%.

[In the article it should be noted that the text on pages 120 and 121 is reversed, so that page 121 should follow page 119.] *J. R. Rose*

PARASITOLOGY: GENERAL

FENG, Lan-Chou, MAO, Shou-Pai & LIU, Erh-Hsiang. **Research on Parasitic Diseases in New China.** *Chinese Med. J.* Peking. 1960, Jan., v. 80, No. 1, 1–20. [65 refs.]

An account is given of the organization set up in 1949 after the establishment of the present Chinese Government, based on principles laid down at the first National Health Conference held in 1950, and of the progress made in subsequent years in combating disease in China.

The Institute of Parasitic Diseases was established under the Chinese Academy of Medical Sciences and similar institutes were set up in the provinces and municipalities. The Chekiang Experimental Institute of Health and other similar institutions were expanded and in the Military Academy of Medical Sciences a department of parasitology and allied units were established. Nationwide surveys and experimental researches have contributed a great deal to the knowledge of the biology, ecology and environmental as well as social factors of parasitic diseases, especially in respect of the five major ones, namely schistosomiasis, malaria, filariasis, leishmaniasis and hookworm disease.

There is only one type of human schistosomiasis in China. The causal organism is *Schistosoma japonicum* and the intermediate host is *Oncomelania hupensis*. Domestic as well as wild animals have been infected, including cattle, goats and sheep, pigs, dogs, cats, donkeys, horses, rats, hares, wild cats and badgers. Much research has been done on factors concerning the hatching of schistosome eggs in human and animal faeces and the life of the resulting miracidia, infection of *Oncomelania* snails by miracidia and their development in the snail, the emission of cercariae from the snail and the conditions influencing the life of cercariae in water, and the bionomics of the snail vector.

The most prevalent types of malaria are those due to *Plasmodium falciparum* and *P. vivax*. The former is most prevalent in the south while the latter is found everywhere. The most malarious region lies south of 25°N., where spleen rates in the hills range from 50 to 100% and in the plains from 10 to 50%. Between 25° and 32°N. they vary from 10 to 50% in the hills and are below 10% in the plains. North of this the spleen rate is below 10%, and the arid

north-west and Inner Mongolia are almost free from malaria. *Anopheles minimus* is the chief vector in the southern region, with *A. jeyporiensis* var. *candidiensis* playing a subsidiary part; *A. leucosphyrus* is a vector in wooded districts, notably in Hainan Island. In the middle region the chief carrier is *A. sinensis*. In the northern area *A. sinensis* is generally the vector, but in places north of 45°N. in the north-eastern provinces and in the northern part of Sinkiang *A. maculipennis messeae* has been incriminated as a carrier.

There are two types of filariasis in China, one due to *Wuchereria bancrofti*, the other to *W.* [*Brugia*] *malayi*. The chief transmitters of *W. bancrofti* infection are *Culex pipiens* var. *pallens* and *C. pipiens fatigans* while *W. malayi* infection is transmitted by *Anopheles sinensis*. *Aedes togoi* may serve as a secondary intermediate host for both types of filariasis in limited areas along the sea coast. *W. bancrofti* filariasis is chiefly found in the low-lying plains and *W. malayi* filariasis in the hilly districts of south China.

Leishmaniasis in China is predominantly of the visceral type, caused by *Leishmania donovani* and transmitted by the sandfly. The age incidence of the disease varies greatly in different areas, the incidence among children varying from 95% in Kansu province to 34% in Kiangsu. The incidence of canine leishmaniasis also varies widely; in some areas it is believed to serve as a source of human infection.

Hookworm disease in China is mainly caused by *Ancylostoma duodenale* and *Necator americanus*. In most places the disease is due to a mixed infection with both species, but in the south *N. americanus* is the more prevalent.

Other parasitic diseases which have been investigated include paragonimiasis, clonorchiasis, vaginal *Trichomonas* infection, ascariasis, enterobiasis and tapeworm infections.

For the control of schistosomiasis and hookworm disease, the storage of night soil with urine under cover and undiluted has proved an effective method for the destruction of helminth ova. This method of storage is readily accepted by the farming population as it does not lessen the value of the night soil as a fertilizer. When fertilizer is urgently needed the destruction of ova is hastened by the addition of various chemicals, such as urea, ammonium bicarbonate, calcium cyanamide, BHC and quick lime.

Residual insecticides are extensively used for the destruction of mosquitoes, sandflies and other insect pests. BHC is now mass-produced in China, though experience accumulated during the past few years has shown that DDT is almost equally effective and lasts longer. The provision of stables for cattle and sties for pigs and the collective feeding of these animals since the establishment of agricultural co-operatives and lately of people's communes are believed to have played an important part in the prevention of tapeworm infection in man and cysticercosis in animals.

The distribution and epidemiology of parasitic diseases in China have been very extensively studied, and much research has been done regarding methods of treatment and prevention applicable on a wide scale. Stress is laid on the importance of linking research with practical problems and on close cooperation not only among specialists in the field of medicine, agriculture, veterinary medicine, biology, water conservancy, pharmaceutics, chemistry, etc., but also between experts and ordinary workers and peasants. The ultimate target is the eradication of the five major parasitic diseases. This record of the progress already made towards such a goal is certainly impressive. *G. Covell*

CHIU, Jui-Kuang & KAO, Chih-Tien. **[The Incidence of Intestinal Parasites among the Elementary Schoolchildren in Hualien Prefecture, Taiwan]** *J. Formosan Med. Ass.* 1959, Mar. 28, v. 58, No. 3, 101–16. [20 refs.] [In Chinese.] English summary.

These authors, from the College of Medicine, Taiwan University, made a survey of intestinal parasites in 3,209 children aged 6–15 in schools in 13 districts in Hualien prefecture, Taiwan. 2,492 were Formosans and 717 Aborigines. Direct smears of single stool specimens were examined, and in 254 positive specimens, Stoll counts of helminth ova were made.

The results are tabulated and discussed.

12% of the children harboured one or more species of protozoa (*Entamoeba histolytica* 1·9%, *Endolimax nana* 1·6%, *Giardia intestinalis* 5%). All rates were higher in Aborigines than in Formosans, except that for *Giardia*. 95·7% harboured helminths (hookworm 29·5%, *Ascaris* 85·1%, *Trichuris* 70·9%, *Enterobius* 52·0%): all rates were higher in Aborigines except that for *Trichuris* which was the same, and *Enterobius*, which was higher in Formosans. (Examination for *Enterobius* was by Scotch tape.)

The special interest of the survey lies in the fact that no other such data are available since those in the official reports of the prefectoral government in 1928–33. The incidences of the 3 helminths, *Ascaris*, *Trichuris* and hookworms, are greater than they were in those earlier reports. [Some of the figures in the text do not agree with those in the table.] *H. J. O'D. Burke-Gaffney*

MCNEAL, J. E. & YAEGER, R. G. **Observations on a Case of Pneumocystis Pneumonia.** *Arch. Pathology.* 1960, Oct., v. 70, No. 4, 397–406, 5 figs. [39 refs.]

A case in an infant in New Orleans.

ANDERSON, C. D. & BARRIE, H. J. **Fatal Pneumocystis Pneumonia in an Adult. Report of a Case.** *Amer. J. Clin. Path.* 1960, Oct., v. 34, No. 4, 365–70, 6 figs.

"Necropsy of a 36-year-old man revealed that he had suffered from almost solid filling of his lung with *Pneumocystis carinii*. The patient had been ill for 10 months, with increasingly frequent attacks of fever, chills, and cough, and he had no intercurrent disease, except a slight degree of cirrhosis.

"Microscopic examination of the lungs revealed little reaction other than severe edema, swelling, and separation of the components of the alveolar walls. Only few organisms were observed in the cytoplasm of histiocytes in the lung and in the sinuses of a hilar lymph node.

"Review of material collected during ante-mortem bronchoscopy revealed recognizable parasites."

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene.]

SERVICE, M. W. **A New Species and Variety of *Anopheles* from Nigeria, with Notes on *Anopheles flavicosta* Edwards and *Aedes* (*Ae.*) *wendyae* Service.** *Proc. Roy. Entom. Soc. of London.* Ser. B. 1960, Sept. 6, v. 29, Pts. 7/8, 85–90, 13 figs.

BAILLY-CHOUMARA, H. Une espèce nouvelle d'anophèle du Golfe d'Aden *Anopheles* (*Myzomyia*) *azaniae* (Diptera, Culicidae). Notes morphologiques, systématiques et écologiques. [**Morphological, Systematic and Ecological Notes on a New Species of *Anopheles* from the Gulf of Aden** *A.* (*Myzomyia*) *azaniae*] *Bull. Soc. Path. Exot.* 1960, May-June, v. 53, No. 3, 531–42, 4 figs.

PRADHAN, S. P. & BRYDON, H. W. **A Record of *Anopheles filipinae* in Nepal.** [Operational & Scientific Notes.] *Mosquito News.* 1960, Sept., v. 20, No. 3, 319–20, 1 map.

MOHAN, B. N. **A Note on the Distention of Abdomen of *Culex fatigans*, when exposed to Dieldrin.** *Indian J. Malariology.* 1960, Mar., v. 14, No. 1, 15–18.

A higher incidence of distention of the abdomen after exposure to dieldrin is recorded in what is described as a normal strain of *Culex pipiens fatigans* than in a strain showing a high degree of resistance to this insecticide as well as resistance to DDT. A similar finding had previously been recorded by this author, along with RAMAKRISHNAN [this *Bulletin*, 1961, v. 58, 140] when the same strains were exposed to gamma BHC.

[The mortalities recorded in the two tables in this article differ very markedly. In Table I a two-hour exposure of the normal strain to 4% dieldrin results in 70% mortality. This in itself indicates heterogeneity and the presence of resistant individuals. In Table II the same strain exposed for only 50 minutes to only 1·6% dieldrin shows 99% mortality. The resistant strain similarly shows very marked differences in the two tables and is probably also a mixed strain.]

G. Davidson

MOHAN, B. N. **A Note on DDT-Resistant *Culex fatigans* with Cross-Resistance to Gamma BHC and Dieldrin.** *Indian J. Malariology.* 1960, June, v. 14, No. 2, 175–8. [12 refs.]

A very high degree of resistance to DDT is recorded in a strain of *Culex pipiens fatigans* from Kallar in South India. The strain was collected from the area before DDT spraying had begun and was colonized in the laboratory. There it was subjected to selection by DDT alone. Exposure of adults of this

selected strain to 4% DDT in Risella oil for a period of 48 hours resulted in only 5% mortality. This compares with a 50% mortality in a so-called normal strain when exposed for 24 hours to 0·724% DDT. The resistant strain was found to be resistant not only to DDT but also to gamma BHC and dieldrin even though it had never been selected by these insecticides. Continued selection by DDT resulted in an increase in resistance not only to DDT but also to the other two insecticides.

[The author of this article seems to be of the opinion that here he has a case of strong "linkage" between DDT resistance and gamma BHC and dieldrin resistance. This is contrary to most other findings on insect resistance to insecticides, where DDT resistance and resistance to the cyclodiene chlorinated hydrocarbons and gamma BHC are considered as two separate entities. It is possible for resistance to dieldrin and gamma BHC to be present in considerable proportion in unselected populations as is pointed out by this author. It is also possible that these resistant individuals show more tolerance to DDT than do normal individuals. The effect of selection by DDT will then be to increase their proportion without the two resistances necessarily being "linked".]

G. Davidson

RAI, L. & LEWALLEN, L. L. **Laboratory Studies of Residual Toxic Effects of Malathion Granules on** *Culex pipiens quinquefasciatus* **Say Larvae.** *Mosquito News.* 1960, June, v. 20, No. 2, 184–6, 1 fig.

GJULLIN and LEWALLEN (*California Mosquito Control Ass., Proc. & Pap. Ann. Conf.*, 1958, v. 26, 28) found that a heavy treatment of a pasture in Fresno Mosquito Abatement District, California, with malathion pellets in August 1956, followed by spray applications of malathion at 0·5 lb./acre remained effective for the rest of the mosquito season. Water from this pasture was also toxic to *Aedes nigromaculis* larvae in September of that year and to *Culex pipiens quinquefasciatus* [*fatigans*] larvae in June of the following year in laboratory tests.

In July 1959, the authors made further tests with susceptible *C. p. quinquefasciatus* larvae on water and mud from the same pasture, using the cup method and the residual technique. No larvae died in the cup tests of mud and water. The residual technique tests were carried out in an enamel pan filled with mud from the suspected breeding place to a depth of 5 cm. The mud was then covered with water from the same breeding place to a depth of about 5 cm. The weighed amount of granules to be used was sprinkled evenly over the water surface and this dosage of granules was tested daily until it was no longer toxic to mosquito larvae. The authors determined the residual toxic effect of malathion on mud by means of Attaclay malathion granules—AALUM, 24/48 mesh containing 10% by weight of malathion. At 1 and 10 lb./acre (weight of the toxicant), malathion was effective over a 3-day period; at 100 lb./acre it was toxic for more than 17 days. *A. M. Guneidy*

DARROW, D. I. & PLAPP, F. W. **Studies on Resistance to Malathion in the Mosquito,** *Culex tarsalis.* *J. Econom. Entom.* 1960, Oct., v. 53, No. 5, 777–81. [18 refs.]

McCLELLAND, G. A. H. **A Preliminary Study of the Genetics of Abdominal Colour Variations in *Aedes aegypti* (L.) (Diptera, Culicidae).** *Ann. Trop. Med. & Parasit.* 1960, Oct., v. 54, No. 3, 305–20, 3 figs. [20 refs.]

Material from a coastal area of Kenya showed a graded variation in the amount of pale scaling on the dorsum of the abdomen of *Aedes aegypti*, from a dark form with basal white bands on some of the abdominal tergites and lateral metallic-silver spots (ssp. *formosus*), through an intermediate form where the silver spots were replaced by aggregations of matt-white scales and some pale-scaling was evident apically on the 1st tergite (type-form), to increasing proportions of pale scales on more and more of the abdominal tergites until nearly the whole abdomen was pale (these pale forms have been grouped as var. *queenslandensis*).

Attempts were made to select towards three main extremes in this graded series, the darkest with silver spots, the darkest with white spots and the palest with white spots. Breeding from any one of these selected types produced some offspring of types other than the parents and the conclusion was reached that the range of pattern from dark to pale abdomen was multifactorially controlled.

Crosses between silver-spotted and white-spotted forms gave strong indications of a single recessive gene for "white-spot" and associated increase in overall paleness.

Among more general observations made were that the males in all cases tended to be darker than the females and that there was a large variation in sex ratios, pale white-spotted males giving offspring with a high ratio of males irrespective of the mothers used. The pale white-spotted form fed much less readily on guineapigs than did the dark silver-spotted form and the latter form showed more rapid larval development. The pale white-spotted form showed a greater variation in egg length than the dark silver-spotted form.

There is some discussion on the possible relation between these findings and the behaviour and distribution of the different forms as they occur in the wild state. *G. Davidson*

JUDSON, C. L. **The Physiology of Hatching of Aedine Mosquito Eggs: Hatching Stimulus.** *Ann. Entom. Soc. of America.* 1960, Sept., v. 53, No. 5, 688–91, 1 fig.

"By polarographic determination of the dissolved oxygen concentration of media used to flood eggs of *Aedes aegypti* and *A. nigromaculis*, the effect of dissolved oxygen in stimulating hatching was found to be twofold. An inverse relation occurred between dissolved oxygen and hatching of eggs flooded under conditions of static oxygen level, very low levels being required to induce a high degree of hatching. In contrast, even a slight lowering of the oxygen level while eggs were flooded proved a powerful hatching stimulus. A decline lasting several hours was found in the dissolved oxygen level at the soil-water interface of flooded soil, so that a decreasing level, rather than merely a very low level, of dissolved oxygen seems to represent the natural mode of stimulation. Exposure of eggs to 50% relative humidity significantly reduced the hatching response as compared with that of eggs kept under high-humidity conditions."

ROGERS, A. J. & RATHBURN, C. B., Jr. **Airplane Application of Granular Paris Green Mosquito Larvicide.** *Mosquito News.* 1960, June, v. 20. No. 2, 105–10, 1 fig.

In earlier papers [this *Bulletin*, 1959, v. 56, 108; *Mosquito News*, 1960, v. 20, 11] the authors describe the formulation and efficacy of granular Paris green for the control of mosquito larvae. This formulation (weighing 12 lb. per cubic foot) was suitable for applications at ground level but was considered to be too light for dispersal from the air.

In this paper the composition of a heavier grade of the granular Paris green, weighing 19 lb. per cubic foot, is given: 35 lb. vermiculite: 40 lb. emulsifiable oils: 25 lb. Paris green powder. Details of suitable brands of oils, emulsifiers and vermiculite, etc., are supplied together with the names of the manufacturing companies. The method of mixing the formula has previously been described (*Mosquito News, loc. cit.*).

Dispersal of Paris green from aircraft is described and it appears that the most favourable results (*i.e.* an effective swath of 60 ft.) were obtained from a "Swathmaster" distributor mounted on a 450 h.p. Stearman aeroplane. The larvicidal effects of Paris green applied in this way from the air were also determined. Pre- and post-treatment counts of mosquito (*Aedes taeniorhynchus* and *A. sollicitans*) larvae were made in various plots of typical mangrove-pickle-weed salt marshes. Applications of 0·75, 0·375 and 0·1875 lb. of the toxicant per acre reduced the number of mosquito larvae after 24 hours by 98·3%, 99·9% and 62·9% respectively.

The authors conclude by drawing attention to the numerous advantages of using Paris green as a larvicide. It is effective against larvae resistant to chlorinated insecticides and its toxic hazards to man, fish, domestic animals and wild life are minimal. Furthermore, resistance to Paris green is, as yet, unknown. *B. C. Fine*

SAUTET, J., ALDIGHIERI, J. & ALDIGHIERI, R. Sensibilité au D.D.T. des adultes provenant du croisement d'une souche d'*Aedes aegypti* sensible avec une souche d'*Aedes aegypti* résistante. [**Susceptibility to DDT of Adults Derived from a Cross between a Susceptible and a Resistant Strain of** *Aedes aegypti*] *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 152–5, 1 fig.

A susceptible strain of *Aedes aegypti* from Lagos, Nigeria, was crossed with a DDT-resistant strain of the same species from Trinidad, and both parent strains and their reciprocal hybrids were exposed for two to three minutes to a two-month-old deposit of DDT [dosage and formulation not stated]. The mortality was then recorded over the ensuing 8 or 9 days. The Lagos strain showed a 70% mortality in one day and a complete kill after 2 days. The Trinidad strain showed a 20% mortality in the first day and a gradual increase in mortality to 100% by the eighth day after exposure. The hybrids showed the initial high mortality of the Lagos strain in the first 24 hours and then a gradual increase in mortality to 100% by the ninth day. The conclusion reached from this unusual method of observation is that resistance is a dominant genetic character. *G. Davidson*

DOBY, J. M., FRITEAU, M. & RAULT, B. Étude de la résistance acquise au D.D.T. chez une souche d'*Aedes aegypti* ayant subi, en laboratoire, une sélection larvaire de 50% environ pendant six générations consécutives. **[Study of Acquired Resistance to DDT in a Strain of *Aedes aegypti* Subjected to Selection at the LD50 Level in the Larval Stage for Six Consecutive Generations]** *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 338–52, 4 graphs. [25 refs.]

A strain of *Aedes aegypti* kept for many years in the Pasteur Institute, Paris, was subjected to selection by DDT at the LD50 level in the larval stage over 6 generations. Exposure was of 3rd stage larvae in glass vessels to very low concentrations of DDT made by adding solutions of this insecticide in a mixture of acetone and alcohol to distilled water. For example, the first exposure was for 21 hours at 21°C. to a dilution of DDT of 1/500,000,000. The larvae were starved for 12 hours before exposure and no food was given until 24 hours after removal from the insecticide. The final mortality was not recorded until 7 days after contact with the insecticide. As the tolerance for DDT increased in successive generations, different exposures were given in attempts to reach the LD50 level for each generation.

Evaluation of acquired resistance has been made by comparing mortalities in the selected and unselected strains when exposed to the same dosage and also to serial dosages. By the fourth selected generation the LC30 of DDT had risen to between 50 to 100 times normal and though a high knock-down was recorded in the selected strain a high recovery rate followed. Normal larvae knocked down failed to recover. By the fifth generation the LC40–50 had risen 100 times and by the sixth generation the LC45 had increased some 250–500 times and the LC25 100–200 times.

Some mosquitoes of the fourth selected generation were used to study the effect of cessation of selection. There was a progressive marked increase in mortality at the single dosage used in the first and second generations produced in the absence of selection. This would seem to indicate that the induced tolerance produced by DDT selection is " vigour tolerance " rather than specific DDT resistance. There is a short review of the literature on acquired resistance to DDT. *G. Davidson*

BROWN, A. W. A. & ABEDI, Z. H. **Cross-Resistance Characteristics of a Malathion-Tolerant Strain developed in *Aedes aegypti*.** *Mosquito News.* 1960, June, v. 20, No. 2, 118–24, 4 figs. [12 refs.]

Since malathion resistance has been developed in larvae of *Culex tarsalis* in California [GJULLIN and ISAAK, this *Bulletin*, 1957, v. 54, 1475], it became important to ascertain whether *Aedes aegypti* larvae would develop this resistance under selection pressure from malathion in the laboratory.

Larvae of a susceptible strain of *A. aegypti* from Malaya submitted to malathion pressure for 8 generations increased in malathion tolerance by 5 times whereas their tolerance of parathion and of diazinon had been slightly increased. Their cross-resistance also increased by 5 times to Sevin but not to the carbamate insecticides: Pyrolan, Dimetilan and isopropyl-phenyl-methyl-carbamate. The tolerance of dieldrin, heptachlor and gamma BHC increased slightly or not at all. A high cross-resistance had developed to DDT and DDD,

but not to methoxychlor. Although the selection pressure was confined to the larvae, the adults of the F_8 generation also developed a 6-fold resistance to DDT.

The fact that the cross-resistance mortality regression lines of the successive generations stayed parallel indicates that the reaction to malathion in the larvae of this strain of *A. ægypti* was that of vigour tolerance rather than true resistance. Accordingly, malathion tolerance in *A. ægypti* resembles that in house-flies in many respects. However, in the development of DDT resistance by malathion pressure on this strain, DDE production was increased by only 40%. Since this cross-resistance to DDT and DDD did not extend to methoxychlor, DDT-dehydrochlorinase is excluded as a mechanism for it.

A. M. Guneidy

BROWN, A. W. A. **Past, Present and Future in Insecticide-Resistance of Mosquitoes.** *Mosquito News.* 1960, June, v. 20, No. 2, 110–15.

Over the past 8 years there has been an increase in the number of different mosquitoes throughout the world exhibiting physiological resistance to various insecticides. This trend is illustrated in tables where the author has listed the anopheline and culicine species which have developed resistance since 1951.

In addition to physiological resistance a new type of resistance, " behaviouristic resistance " has emerged; that is, through modifications in behaviour some mosquitoes are able to avoid taking up lethal doses. *Anopheles albimanus* in Panama, for example, has become hyper-irritable to DDT deposits and leaves treated surfaces before acquiring a lethal dose. Some other mosquitoes are known to avoid contact with insecticides by resting outside, instead of inside, dwellings.

The origin of resistance is discussed in terms of modern genetics; the pre-adaptive nature of the resistance phenomenon is stressed and the mechanisms governing the inheritance of resistance in some species are indicated.

Attention is drawn to cross-resistance patterns. DDT resistance extends to its analogues but is distinct from dieldrin resistance. The latter is associated with resistance to other cyclodiene derivatives and gamma BHC. The mechanism of DDT resistance in mosquitoes is still not clearly understood and the mechanism of resistance to dieldrin remains a mystery. Organophosphorus resistance in *Culex tarsalis* and *Aedes nigromaculis* is specific to malathion and parathion, respectively, and does not involve any cross-tolerance between the two compounds. However, a (laboratory developed) malathion-resistant strain of *Aedes aegypti* showed cross-tolerance to the carbamate, Sevin, and high cross-resistance to DDT.

On the question of the detection of resistance the value of the dosage-mortality regression lines is emphasized. The lines are useful in distinguishing between " vigour tolerance " and incipient physiological resistance.

The best hope for halting the spread of resistance is to be found in the use of compounds whose cross-resistance is negatively correlated with modern insecticides. Such compounds are already known (cetyl fluoracetate, phenyl thiourea, etc.) but their action against mosquitoes has not been convincing. It is suggested, however, that the search for more compounds of this nature should continue. In the meantime, the author suggests the cautious use of insecticides, the re-introduction of older control techniques, and more reliance on environmental and biological control so that " we can buy time to continue the search for definite means of counteracting resistance ".

B. C. Fine

VARGAS, L. **The Subgenera of *Culicoides* of the Americas (Diptera, Ceratopogonidae).** *Rev. Biologia Trop.* San José, Costa Rica. 1960, July, v. 8, No. 1, 35–47, 1 fig. on pl.

MULLA, M. S. **Loss of Activity of Chlorinated Hydrocarbon Insecticides in Soil as measured against the Eye Gnat, *Hippelates collusor*.** *J. Econom. Entom.* 1960, Oct., v. 53, No. 5, 785–7.

NAGASAWA, S. **The Toxic Action of a Mixture of Sevin and *p,p'*-DDT to the House Fly.** *J. Econom. Entom.* 1960, Oct., v. 53, No. 5, 709–11, 1 fig.

"The toxic action of a mixture of Sevin (1-naphthyl methylcarbamate) and *p,p'*-DDT to adults of the house fly (*Musca domestica* L.) has shown a compound response curve which indicates that these two toxicants have different types of toxic action. Sevin was about one-ninth as toxic as *p,p'*-DDT."

STARKOFF, O. Ixodoidea della Sardegna. [**Ixodoidea of Sardinia**] *Parassitologia.* Rome. 1960, Apr.–Aug., v. 2, Nos. 1/2, 301–9. [Numerous refs.] English summary (2 lines).

CLIFFORD, C. M. & ANASTOS, G. **The Use of Chaetotaxy in the Identification of Larval Ticks (Acarina: Ixodidae).** *J. Parasitology.* 1960, Oct., v. 46, No. 5, 567–78, 12 figs. on 2 pls.

ROMAN, E., BATTESTI, M. R. & CHARRET, J. Parasitisme chez un nourrisson de larves hexapodes de l'acarien *Argas reflexus*. [**Parasitism of an Infant by Hexapod Larvae of *Argas reflexus***] *Bull. Soc. Path. Exot.* 1960, May–June, v. 53, No. 3, 420–23. [14 refs.]

The patient was a child aged 6 months in the Lyons area.

See also p. 258, ARRU [*Tyroglyphus siro* **as a Cause of Skin Disease in Man and Animals**].

EBELING, W. **Control of the Tropical Rat Mite.** *J. Econom. Entom.* 1960, June, v. 53, No. 3, 475–6, 1 fig.

When rats occur in houses, the tropical rat mite, *Ornithonyssus bacoti*, may attack man, producing by its bites irritation and sometimes painful dermatitis. Complete control of rats would, of course, result in elimination of the rat mites from infested premises. However, apart from the fact that rat control may often be difficult and expensive, the destruction of rats may cause the parasitic mites to deviate to human beings. Thus destruction of the mites seems to be the more feasible method. The various acaricides and fumigants in use have the disadvantage of either losing their toxicity too rapidly or of being expensive.

The successful use of a fluoridated silica aerogel dust for the control of drywood termites suggested the use of this material for control of rat mites in houses. In 5 infested houses and 1 two-storey house where the inhabitants had been attacked by rat mites, a silica aerogel containing 4·7% ammonium fluosilicate at the rate of 1 pound to 1,000 sq. ft. of attic area was blown into attics, and crevices, beds and mattresses where the mites might be lurking were dusted with this powder. These measures brought about the elimination of the mites without any reinfestation occurring. The silica aerogel does not depend on toxic action for its effect, but acts by the adsorption of the lipoid protective layer of the pest which crawls over the residue, thus killing it by dehydration.

The author suggests that this material may be successfully employed in controlling bird mites and house-mouse mites which may invade houses and attack man.

[The dusting powder used by the author is known as Dri-Die 67 and was obtained for the experiments through the courtesy of Davison Chemical Company, Baltimore, Maryland, U.S.A.] *M. G. R. Varma*

ESPADAS R. S., R. & OJEDA LOAEZA, J. Estudio de la anilina como reactivo en la microdeterminación fotocolorimétrica del DDT. [**Study of Aniline as a Reagent in the Photocolorimetric Microassay of DDT**] *CNEP. Bol.* Mexico. 1960, Apr.–June, v. 4, No. 2, 86–92, 4 graphs. [21 refs.] English summary.

BAMI, H. L. & DHATT, M. S. **Influence of Pre-Test Homogenisation on the Suspensibility of Insecticide Water Dispersible Powders.** [Research Notes.] *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1959, Nov., v. 7, No. 6, 173–5.

The WHO method (*Specifications for Pesticides*, 1956, WHO, Geneva) and ISI method (Indian Standards Institution: IS 565, 1955, and IS 562, 1955/1958) for the determination of suspensibility of insecticide water-dispersible powders did not refer to the time and the manner by which the powder is to be stirred into a uniform paste. These factors may greatly affect the final suspensibility values. In addition, the sub-standard powders, which will take a long time to be made into a uniform paste, might appear as satisfactory as the standard ones. Such a prolonged treatment is also impracticable in field work. Taking these points into consideration, the authors undertook these investigations.

Samples of 75% and 50% DDT water-dispersible powders (U.S.A. origin) and one sample of 50% gamma BHC powder (Indian origin) were submitted to different pre-test homogenization treatments.

Statistical analysis of suspensibility values of DDT powders revealed that vigorous stirring or paste-making, followed by short or prolonged periods of keeping, were of no advantage over making these powders into a slurry with one minute's stirring only. The same results were obtained after accelerated tropical treatment. In this case, however, the values were adversely affected by prolonged pasting and keeping.

The suspensibility values of gamma BHC were almost identical in all cases. Accordingly, the authors reported that simple slurry making was not only rapid but offered the optimum results irrespective of the type of pre-test homogenization treatment involved. *A. M. Guneidy*

HAYDEN, D. L. **Dispersal of Insecticides from Jet-Propelled Aircraft.** *Mosquito News.* 1960, Sept., v. 20, No. 3, 241–6, 1 fig.

SALMELA, J., SIDLOW, A. J. & DAVIS, A. N. **A New Thermal-Aerosol Generator for dispersing Insecticidal Fogs from a Stearman Airplane.** *Mosquito News.* 1960, Sept., v. 20, No. 3, 275–80, 3 figs.

MISCELLANEOUS PAPERS

KHALEQUE, K. A., MUAZZAM, M. G. & ISPAHANI, P. **Further Observations on the Effects of Fasting in Ramadhan.** *J. Trop. Med. & Hyg.* 1960, Oct., v. 63, No. 10, 241–3. [14 refs.]

This report is a sequel to that abstracted in this *Bulletin* [1960, v. 57, 426]. In it, the effect of the diurnal abstention from food and drink throughout the month of Ramadhan on the erythrocyte sedimentation rate [ESR], the haematocrit, the serum potassium level, the gastric acid secretion and the electrocardiogram [ECG] are recorded. Adults of each sex, between the ages of 20 and 65 years, were the experimental subjects, and there was a small number of non-fasting controls.

The ESR did not vary in either group during the month, nor was the haematocrit significantly altered. The mean serum potassium levels obtained before the fast were higher in the evening (5·7 m.Eq./litre) than in the morning (5·0 m.Eq./litre): by the end of the fast this trend was reversed. Gastric acid secretion was in the early days of the fast high in the evening, but soon adjusted itself to the abnormal meal times. The ECG tracings did not alter during the observation period.

The authors conclude that the inversion of the eating and drinking rhythm which occurs in Ramadhan causes no fluid or electrolyte disturbance in the body. [The previous paper suggested that the lowering of activity which commonly occurs during the day in Ramadhan is due to hypoglycaemia.]

J. H. Walters

DEAN, N. M. B. **The Study of the Calabar Hospitals.** *West African Med. J.* 1960, Oct., v. 9 (n.s.), No. 5, 208–14, 2 figs.

REPORTS AND SURVEYS

COLONIAL OFFICE. **Colonial Research 1958–1959. Colonial Medical Research Committee. Fourteenth Annual Report 1958–1959** [HIMSWORTH, H. P., Chairman] (pp. 209–60) Cmnd. 938. 419 pp. 1959, Dec. London: H.M. Stationery Office. [18s.]

51 research projects were in progress under the aegis of the Committee during the period covered by this report. Increasing attention has been devoted to the fostering of research in schistosomiasis and it is proposed to strengthen the group investigating this subject at the East African Institute of Malaria and Vector-Borne Diseases at Amani, Tanganyika, and at the East African Institute for Medical Research at Mwanza. New projects include studies on hypertension in Jamaica, the toxaemias of pregnancy in Hong Kong, nutrition at the University College of the West Indies, Jamaica, and the arthropod-borne viruses at the London School of Hygiene and Tropical Medicine.

Helminthiasis

Studies are in progress on loiasis in the British Cameroons and Nigeria. Laboratory tests of the effects of various insecticides have indicated that dieldrin is the most potent against *Chrysops* larvae and this has been confirmed by preliminary field tests. Onchocerciasis has been studied in the Cameroons and comparative trials have been begun with suramin and other drugs. Studies of the Simuliidae, some species of which are vectors of onchocerciasis, have been carried out in Kenya, Uganda and Tanganyika.

Treatment schemes for the control of *Wuchereria bancrofti* infection on Ukara Island in Lake Victoria have been completed. In Nigeria, studies on the possibility of utilizing frogs infected with the larvae of the nematode parasite, *Camallanus lacustris*, in ponds to reduce the incidence of guineaworm infection in rural areas, indicate that this method might succeed if applied in small ponds in the rain-forest areas.

Malaria

At the East African Institute of Malaria and Vector-Borne Diseases, Amani, activities continued to be divided between fundamental research, the application of knowledge to East African problems, and the dissemination of knowledge among those concerned in the use of antimalarial measures in East Africa. The anopheline assessment in the Taveta-Pare Scheme has not shown any new trends in mosquito behaviour, nor in the susceptibility of *Anopheles gambiae* and *A. funestus* to dieldrin. Vital statistics collected in this area indicate an increased fertility and a declining infant mortality rate since the inception of spraying. There has also been maintained a rise in haemoglobin levels and a downward shift from the common African patterns of high gamma globulin values in the blood sera of younger people. A certain amount of malaria transmission still persists in this area.

In Trinidad much progress is reported in curbing the incidence of malaria due to transmission by *A. bellator*, which bites out of doors and breeds in species of bromeliad epiphytes growing on the shade trees planted in the cocoa plantations. In Nigeria, studies have been made by a newly developed technique on the susceptibility to insecticides of anopheline larvae. Studies have

also been made on various problems connected with the appearance of resistance to different insecticides and to the length of persistence of insecticides on mud surfaces. In the Gambia a report on a 12-months' trial of prophylaxis with pyrimethamine in a village indicated that (a) fortnightly dosage with this drug reduced parasitaemia profoundly, (b) mean haemoglobin levels were higher in the treated village, (c) rates of hepatic and splenic enlargement were much lower in the treated village, (d) mean heights and weights for the various groups by sex showed little difference and (e) fewer children in the second year of life died in the treated village.

At the Liverpool School of Tropical Medicine studies have been carried out on tissue enzymes in malarial infection. Results have shown that there is a biochemical lesion in the livers of mice infected with *Plasmodium berghei* in the terminal stages of the infection.

Virus Diseases

At the laboratories of the West African Council for Medical Research, Lagos, Nigeria, studies have been undertaken to determine whether the very low incidence of clinical yellow fever in many parts of the country may be due to partial resistance to the virus induced in the population by immunity to related group B arborviruses. Experiments with monkeys hyperimmunized against dengue viruses and subsequently challenged with viscerotropic yellow fever virus lend support to this theory. Investigations on schoolchildren in Lagos suggest that in this locality there has been very little transmission of yellow fever and possibly also of related viruses for some years.

At the East African Virus Research Laboratory, Entebbe, Uganda, the mechanism of transmission and maintenance in nature of the arthropod-borne viruses continued to be the main interest. Nairobi sheep disease virus (NSD), has now been isolated from captive duikers. Antibody surveys show that human infections with this virus are very common around Entebbe, the first indication that NSD virus infects man. An extensive antibody survey on local residents is in progress. Results so far show a low incidence of immunity to Rift Valley fever and yellow fever and a high incidence of immunity to Chikungunya virus and NSD. Studies on the important subject of age-grading in mosquitoes have been continued.

At the Trinidad Regional Virus Laboratory, Port of Spain, 29 virus isolations were made during 1958, 3 from human beings, 16 from mosquitoes, 1 from ticks, 6 from wild birds and 3 from chickens, making a total of 159 arthropod-borne viruses isolated from 1953 to 1958. Tissue-culture techniques with chick embryo and hamster kidney cells were explored and routine culture techniques established. No evidence of recent yellow fever activity has been observed in Trinidad or in the other islands surveyed.

The Medical Research Council Trachoma Group has greatly expanded its activities in the Gambia and at the Lister Institute, London. In the Gambia, virus was isolated from 17 patients in whom conjunctival inclusion bodies were found. It was also isolated from 7 out of 12 trachoma patients negative for inclusion bodies; a control group of 25 non-trachomatous subjects all failed to yield virus by chick-embryo inoculation. Strains of virus isolated in the Gambia are being studied at the Lister Institute, where particular attention is being directed to their antigenic constitution and relationship with other members of the psittacosis-lymphogranuloma group of viruses.

Physiological and Nutritional Research

Studies on the absorption of foodstuffs, cutaneous excretion of nitrogen, energy cost of activity and body composition have been carried out at the East African Institute for Medical Research, Mwanza. Studies on nutritional ophthalmology are also in progress and experimental work to determine the connexion between malnutrition and eye disease, begun at the Human Nutrition Research Unit of the Medical Research Council, London, has been continued. In an investigation of xerophthalmia and keratomalacia in the Central Province of Tanganyika it was shown that vitamin A deficiency is a major cause of blindness in that area. The idiopathic eye condition "spontaneous iris prolapse", possibly related to malnutrition, has been reported from East Africa for the first time. At the Mulago Hospital, Kampala, Uganda, the Medical Research Council's Infantile Malnutrition Research Unit has continued its comprehensive study of the effects of malnutrition on the growth and development of African children.

From the Unit in the United Kingdom it is reported that animal experiments on protein malnutrition have been conducted in which two main types can be produced; one, the marasmic form, in animals fed on a diet containing low concentrations of protein of low nutritive value; the other, corresponding to kwashiorkor, can be produced with the same ration fed together with an equal weight of carbohydrate. Attention has also been given in the past 3 years to the determination of the protein value of human foods, particularly those of tropical countries.

Investigations on sickle-cell trait and sickle-cell anaemia

Further studies on the subject of abnormal haemoglobins have been carried out in London at the Postgraduate Medical School of London, the MRC Laboratories, University College, and St. Bartholomew's Hospital.

In Nigeria the effect of acetazolamide (Diamox) on patients with sickle-cell anaemia has been studied, but the results were disappointing. Studies on the possibility of preventing sickle-cell crises by anti-coagulant treatments have shown that thrombin-generation can be lowered considerably by the oral application of magnesium, and investigations are in progress on the most suitable way of administering it on a long-term basis.

Leprosy

A research unit operating as part of the Nigeria Leprosy Service, Eastern Nigeria, has conducted a series of trials of diethyl-dithiol-isophthalate (ETIP or Etisul), a derivative of ethyl mercaptan. It is already clear that this is a drug of considerable potential importance. Its use in combination with DDS promises considerably to accelerate the resolution of lepromatous cases.

Trials of diphenyl thiourea compound (DPT) conducted over the past four years have demonstrated that this drug has a useful place in the chemotherapy of leprosy. Diamino-diphenyl-sulphoxide (DDSO) has also been tried out over the past 3½ years, and has proved equally effective.

At Makerere College, Uganda, experiments designed to measure dehydrogenase activity in mycobacteria have been continued. A more sensitive method of detecting biochemical change is being sought by the use of radioactive tracers.

Biopsy material from patients with lepromatous leprosy treated with DDS in

the Congo has been intensively studied at the Strangeways Research Laboratory, Cambridge. Further material for this study was obtained from leprosaria in Uganda and from the East African Leprosy Centre at Alupe, Kenya. Light and electron studies on *in vitro* inoculation of explants were continued.

Reports on therapeutic trials of DPT from the East African Research Centre, Alupe, suggest that this drug is more effective than DDS in some respects, especially in the first 12 months of treatment. Therapeutic trials with Etisul have given excellent results. Combinations of this preparation with DDS, DPT and TBI seem to be still more effective.

At the National Institute for Medical Research, London, studies on leprosy bacilli have been carried out by means of the electron microscope. The multiplication of *Myco. leprae-murium* in tissue culture has also been investigated.

Histological examinations of skin and peripheral nerve biopsies taken from treated and untreated leprosy patients during visits to Northern Nigeria have been made at Oxford in the Department of Human Anatomy.

Tuberculosis

Chemotherapy trials with isoniazid alone or in combination with thiosemicarbazone substituted diphenylthiourea (DPT) or PAS are in progress in a number of hospitals in Kenya, Tanganyika and Uganda. An unfavourable factor demanding urgent investigation is the increasing incidence of bacterial resistance to isoniazid in the sputum culture of patients submitted for inclusion in the trials.

Chemotherapy trials with various combinations of isoniazid with PAS and streptomycin are also in progress at the West African Tuberculosis Research Unit, Kumasi. A comparison between in-patient and out-patient chemotherapy with Streptohydrazid (streptomycylidene isonicotinyl hydrazine; approved name streptonicozid) over a period of 3 months gave no indication that in-patient treatment has anything to offer over out-patient treatment, provided that constant therapy in each group can be assured.

Researches on various insect vectors of disease

These include studies on the biology of sandflies in East Africa, in connexion with the transmission of kala azar, and of *Simulium* in Kenya, Uganda and Tanganyika, *Chrysops* in Tanganyika and *Culicoides* in Jamaica.

Brief reference is also made in the Report to various research activities undertaken and financed by the medical departments of Colonial Territories.

G. Covell

West African Council for Medical Research, covering the Territories of Gambia, Ghana, Nigeria and Sierra Leone. **Annual Report 1st July 1958–30th June 1959.** 30 pp., 4 figs. on 4 pls. 1959. Yaba, Lagos, Nigeria.

Work on a wide variety of projects is reviewed in this report. The Helminthiasis Research Unit is working on loiasis and onchocerciasis. Dieldrin has proved to be a satisfactory and persistent larvicide of *Chrysops* spp. when

sprayed on mud. Out of several compounds tested as prophylactics against *Loa loa*, one called M & B 2948A showed promise. The effect of mass treatment with Banocide [diethylcarbamazine] on the future transmission of *L. loa* is being investigated. Experimental treatment of onchocerciasis has continued. The antimony compound TWSb has shown promise. Experiments are being made with small dosage schedules of suramin.

The Tuberculosis Research Unit, centred on Kumasi in Ghana, continued research in chemotherapy, but found itself hampered by high absconding rates. It is also stated that injection therapy is not at the moment practical in the rural areas of Ghana. [It seems to the abstracter that if trypanosomiasis can be treated in the bush, so can tuberculosis. Virtually 100% attendance, over years, of leprosy patients has been achieved, so if the tuberculosis patients abscond perhaps the fault is not entirely theirs. There will never be enough beds for tuberculosis treatment available in tropical countries, and the situation cries out for the medical field unit system.]

The Virus Research Unit has continued its fascinating epidemiological surveys, revealing more "silent" epidemics of yellow fever, but also finding that there has been little, if any, transmission of yellow fever in Lagos for the last 30 years at least. Ex-Medical Officers of Health no doubt will read this with satisfaction; but alas, experimental exposure of water pots indicated that *Aedes aegypti* is still abundant. At Abeokuta 63% of 150 persons tested were positive to the specific mouse intracerebral neutralization test. Much more of the work of this unit cannot be summarized here; 12 papers were published by its members during the year, and may be found under the names of J. P. T. Boorman, L. R. Boulger, R. W. Crosskey, F. N. Macnamara, J. S. Porterfield and G. Surtees.

The Child Health Unit's study of children and mothers at Imesi Ile, Nigeria, had been in operation for 2½ years at the date of the report, and analysis of its findings is not yet being made. Several smaller projects received research grants. [For previous Report, see this *Bulletin*, 1959, v. 56, 579.]

B. B. Waddy

Congo Belge. Fonds Reine Élisabeth pour l'Assistance Médicale aux Indigènes du Congo Belge. Rapport sur l'activité durant l'année 1958. [**Report on the Activities of FOREAMI during 1958**] 144 pp., illustrated. [1960.] [Also in Flemish.] Brussels: 14, Square de Meeûs.

The 1955 report of FOREAMI coinciding with the 25th anniversary of its foundation, gave a detailed account of its methods [see this *Bulletin*, 1957, v. 54, 509]. The main responsibility of the organization is for Kwango Province. Here nearly 90% of the entire population were examined by field teams during 1958, a percentage only a little above average. In addition there is one hospital bed (not including sanitaria or leprosaria) to each 208 persons. This is a service perhaps not approached anywhere else in Africa.

The progress of trypanosomiasis control is reviewed. From 1935 to 1940 the classic methods of survey and treatment, and tsetse control, reduced endemicity spectacularly but without offering any hope of eradicating the disease. Mass prophylaxis, applied only in the most active foci, halved again

the endemic incidence between 1940 and 1949. Since 1949 prophylactic pentamidine has been extended to trypanosomiasis-free areas bordering on endemic foci; this has resulted in the rate of new infections dropping from 0·21% in 1948 to 0·02% in 1958. Persons suffering from trypanosomiasis with advanced changes in their spinal fluid are found by survey, 6, 18 and 24 months after initial pentamidine prophylaxis. It is not clear whether these infections were acquired before or after prophylaxis.

The section on leprosy gives some notable details about treatment. DDS is administered with extreme caution. Dosage is daily except for Sundays, with a week's break after each 3 weeks' treatment. The full daily dose is reached only after 20 to 40 weeks' treatment, according to the type of leprosy. 39 patients, most of whom had had unsuccessful DDS treatment, were given *marianum* antigen [see BLANC *et al.*, *ibid.*, 1954, v. 51, 804 and 1956, v. 53, 69]. Improvement was noted in 27%, but there were some serious side effects. Corticotrophin is said to be the treatment of choice for lepra reactions, but the more homely drug mepacrine has also given good results.

The review of malaria includes analyses of endemicity and costs of anti-malaria campaigns. DDT spraying has been abandoned in Kwango (at least in parts) in favour of fortnightly mass prophylaxis with pyrimethamine. The incidence of quartan malaria seems to be unusually high. 50% of infections in one survey were with *Plasmodium malariae*, and in another 34·4% showed *P. malariae* alone or mixed with *P. falciparum*.

The mass vaccination of persons under 20 years old, reactors and non-reactors, with BCG was completed in 1958. A lyophilized vaccine was employed at a dosage of 0·1 mgm. in 0·1 ml. of saline, at the modest cost of 1 franc per dose. Two mobile radiography units are operating, and 10 districts have portable X-ray sets. For tuberculosis treatment, the standard method is to use the three major drugs in combination.

FOREAMI's activities were extended during 1958 to a defined area of the north of the Congo, the Uélé Section, partly abutting on the Sudan and peopled largely by the Azande. As in the Sudan, the Azande are a diminishing race, owing to low birth rates, 10 to 13 per mille, contrasted with the rate of 40 per mille in Kwango. Universal gonorrhoea is only one of many reasons. Trypanosomiasis, leprosy (the incidence of which reaches 7%) and endemic goitre have cost this region much population, and deep psychological factors are involved.

A focus of yellow fever was discovered north-east of Doruma, near the Sudan frontier. Some 60,000 vaccinations were performed, mostly with Dakar vaccine.

[It is presumed that there will be a report on FOREAMI's work in 1959, but how much of this great service will survive the political events of 1960? Unless efficient substitutes for FOREAMI and the French SGHMP continue to function, diseases such as trypanosomiasis and cerebrospinal meningitis may, and probably will, return to their full, lethal potential in West Africa.]

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